Anexo 7: Análisis Bibliométrico Exploratorio de la UCV en el Área de Energía

Búsqueda en cuatro bases de datos internacionales

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Resumen

El Proyecto "Gestión del Conocimiento en la UCV: Área de Energía" tiene entre sus objetivos específicos establecer los activos de conocimientos con que cuenta la Universidad Central de Venezuela en el Área de Energía, con el fin de proceder a su caracterización desde el punto de vista de su conocimiento, el cual constituye su razón de ser como sistema universitario. Con este fin se decidió el uso de la metodología de *Mapas de Conocimiento* para su caracterización en la dimensión cognitiva, de manera de que, en conjunto con sus dimensiones socio-institucionales y estructurales, se pueda elaborar una descripción sistémica que permita su estudio en función de sus posibilidades de transformación sobre la base de una visión prospectiva, objetivo general del proyecto. En este trabajo se presentan los resultados de un estudio bibliométrico exploratorio de su producción intelectual en el área de energía durante los últimos 10 años, tal como aparece reflejada para la comunidad científica global en cuatro bases de datos internacionales a las que se tuvo acceso en una primera aproximación. El objetivo fue evaluar la estrategia más adecuada para el levantamiento de información por búsqueda bibliográfica vía electrónica y tener una primera medida de las dificultades y del tipo de resultados a esperar.

El análisis bibliométrico se sustento principalmente en la consulta realizada a la base de datos de la Universidad de Tulsa (Petroleum Abstracts), la cual se orienta a recopilar la información del área de exploración y producción de hidrocarburos. Entre los resultados relevantes de la búsqueda en la base de datos Tulsa, se destacan un total 178 referencias bibliográficas publicadas por la UCV durante el período 1975 - 2005, de las cuales un 75% se ha publicado en el periodo 1994-

2005. A su vez, el 54% de los documentos son artículos de conferencias, y el resto de revistas técnicas, entre las que figura la *Revista Técnica de la Faculta de Ingeniería de la UCV* con 18 artículos. La consulta de otras tres bases de datos internacionales, para indagar sobre la producción intelectual de la UCV en las áreas de refinación y energías alternas, arrojó un total de 16 referencias bibliográficas.

Adicionalmente se hacen algunas recomendaciones sobre la base de la experiencia ganada para el levantamiento completo y más formal de de la literatura en energía producida por la UCV; y se anexan un resumen de todas las referencias encontradas y la estructura organizacional y el personal docente y de investigación disponible en cada una de ellas.

1 Introducción

El proyecto "Gestión del Conocimiento en la UCV: Área de Energía" [1] tiene entre sus objetivos específicos establecer los activos de conocimientos con que cuenta la Universidad Central de Venezuela en el área de energía, tales como expertos, experiencias, documentos, artefactos, relaciones y otros, con el fin de proceder a su caracterización desde el punto de vista de su conocimiento, el cual constituye su razón de ser como sistema universitario. Con este fin se decidió el uso de la metodología de *Mapas de Conocimiento* para su caracterización en la dimensión cognitiva, de manera de que, en conjunto con sus dimensiones socio-institucionales y estructurales, se pueda elaborar una descripción sistémica que permita su estudio en función de sus posibilidades de transformación sobre la base de una visión prospectiva, objetivo general del proyecto. En este trabajo se

[1] Convenio Específico de Cooperación entre Total Oil & Gas Venezuela B.V. y la Universidad Central de Venezuela para la ejecución del proyecto "Gestión del Conocimiento en la UCV: Área de Energía", 29 de Julio, 2005.

presentan los resultados de un estudio *bibliométrico* exploratorio de su producción intelectual en el área de energía, tal como aparece reflejada para la comunidad científica global en cuatro bases de datos internacionales a las que se tuvo acceso en una primera aproximación. El objetivo fue contar con una primera aproximación al problema del levantamiento de información accesible en medios electrónicos, para evaluar la estrategia más adecuada hacia este fin y tener una primera medida de las dificultades y del tipo de resultados a esperar.

Para cumplir con este propósito, en el capítulo 2 se describe la metodología usada, y en el capítulo 3 los resultados obtenidos, tanto de la universidad como un todo, como en las áreas temáticas o disciplinas que resultaron más relevantes. En el capítulo 4 se explicitan algunas de las lecciones aprendidas y recomendaciones relevantes para las búsquedas definitivas. En el anexo 5.1 se presenta un resumen de la información disponible en las páginas web de la UCV a Diciembre del 2005 sobre las facultades y escuelas directamente relacionadas con el área de energía, destacándose lo relativo a la estructura organizacional y al personal docente disponible en cada una de las ellas; y en el anexo 5.2 se documentan los títulos y resúmenes de información bibliográfica recopilada y analizada

2 Metodología de trabajo

El *Análisis Bibliométrico* es una técnica que se refiere al tratamiento estadístico de la información bibliográfica, o también se puede decir análisis cuantitativo de la información, donde mediante la revisión de indicadores como la fecha de publicación y el numero de publicaciones por autor o por institución generadora, se muestran tendencias generales en un área del conocimiento, en especial de la información técnico- científica (como documentos de patentes,

artículos técnico o conferencias). La mejor fuente para información especializada son las bases de datos internacionales, en las cuales diariamente cientos de científicos leen la literatura de revistas científicas y patentes para analizar e indexar la información de manera que ésta se pueda encontrar fácil y consistentemente en las bases de datos, con el fin de habilitar la investigación científica y tecnológica[2].

Para este trabajo se lograron consultar las siguientes bases de datos internacionales:

Tulsa: Esta base de datos es reconocida por su excelente cobertura internacional en el área de exploración y producción de hidrocarburos, incluyendo geología, geofísica, geoquímica, perforación, explotación, etc[3] con referencias bibliográficas en 835.200 registros para diciembr del 2005, que datan desde el año 1965 al presente. La búsqueda bibliográfica del presente trabajo se centró en esta base de datos, cuya cobertura temática es:

- Alternate fuels and energy sources
- Drilling
- Ecology and pollution
- Geochemistry
- Geology
- Geophysics
- Mineral commodities
- Petroleum exploration, production, and development
- Pipelining and storage

[2] Por ejemplo, ver: "General Philosophy". CA (Chemical Abstracts) Search, producido por Chemical Abstracts Service, Ohio, USA:
[3] La base de datos conocida como Tulsa se refiere a "Petroleum Abstracts" de la Universidad de Tulsa en Oklahoma, USA. http://www.cas.org/ONLINE/DBSS/tulsass.html.

- Production of oil and gas
- Reservoir engineering and recovery methods
- Supplemental technology
- Well completion and services
- Well logging

Proveniente de mas de 300 revistas y 200 "proceedings" cubiertos anualmente, además de patentes, documentos y reportes gubernamentales, libros y otras fuentes[4].

Para cubrir el área de refinación y otras fuentes de energía se consultaron además las siguientes bases de datos:

***Energy Science and technology*:** conocida anteriormente como *DOE Energy*, está basada en un archivo multidisciplinario que contiene referencias de todo el mundo desde 1976, de la literatura de las ciencias básicas y aplicadas, y de la investigación técnológica[5;6.] En relación con su alcance, la cobertura temática de esta base de datos es:

- Biology
- Biomedicine
- Chemistry
- Coal, Gas, Oil, Hydroelectricity
- Conservation Technology
- Direct Energy Conversion
- Energy Policy

[4] http://www.ovid.com/site/catalog/DataBase/1878.jsp?top=2&mid=3&bottom=7&subsection=10.
[5] http://grc.ntis.gov/energy.htm
[6] Energy Science & Technology es producida por la Oficina de Información Científica y Tecnológica del Departamento de energía (DOE) de los Estados Unidos.

- Engineering
- Environmental Science
- Geosciences, Geothermal Energy
- Hazardous Waste Management
- Human Genome Project Methodology
- Isotope/Radiation Technology
- Materials Handling
- Metals and Ceramics
- Nuclear and Thermonuclear Power
- Renewable Energy Sources (Solar, Wind, Biomass, Tidal Energy)
- Physics
- Synthetic Fuels

Ei EncompassLit: Con 662.921 registros provee desde 1964 una cobertura completa de la literatura relacionada con el petróleo, la petroquímica, el gas natural y las industrias relacionadas con el sector energético[7;8]. Toma su data de la siguiente literatura técnica: *Petroleum Refining & Petrochemicals*, *Health & Environment*, *Transportation & Storage*, *Petroleum Substitutes*, *Catalysts/Zeolites*, *Tribology*, *Reformulated Fuels*, and *Oilfield Chemicals*.

En relación con su alcance, su cobertura temática incluye:

- Air, land, and water pollution control
- API Standards and specifications
- Catalysis
- Corrosion

[7] Ei EnCompassLit es producida por Elsevier Engineering Information, Inc., Hoboken, NJ.
[8] http://library.dialog.com/bluesheets/html/bl0954.html.

- Energy conservation and alternate energy sources
- Environmental issues
- Fuels, lubricants, and other petroleum products
- Government regulations
- Health and safety
- Mergers and acquisitions
- Natural gas
- Oilfield chemicals
- Petrochemical processes and products
- Petroleum refinery processes and engineering
- Pipelines, tankers, and storage
- Process control
- Refining
- Supply and demand
- Synthetic fuels
- Transportation and storage

El análisis cuantitativo (bibliométrico) de la información publicada internacionalmente por la UCV en bases de datos relacionadas al área de energía, solo requiró especificar el término "Energía"[9], e introducir en el campo de "Fuente Corporativa" o "Corporate Source" la denominación de la Universidad Central de Venezuela[10]. Los resultados obtenidos permitieron tener un borrador preliminar del estado del conocimiento en esta área visto desde el prisma internacional. Eeste

[9] A través de los tesauros correspondientes se garantiza el acceso cualquier información relacionada con la temática que cubre la base de datos correspondiente aunque no aparezca la palabra específica en el docuemnto, sin necesidad de tener que ser referido cualquier otro término por el usuario. Ver por ejemplo "pipeline" en Tulsa, cuyo tesauro hace referencia a 71 términos diferentes relacionados. http://www.cas.org/ONLINE/DBSS/tulsass.html.
[10] Por ejemplo en TULSA ese campo se denomina CS= VENEZUELA CENTRAL UNIV.

análisis solo representa la perspectiva de lo publicado por la UCV en publicaciones reconocidas (arbitradas) en el ámbito internacional. Es de notarse que aparecen pocas publicaciones nacionales, pero entre éstas se encontró la revista de la facultad de Ingeniería de la UCV.

En las siguientes secciones se presetan los resultados obtenidos.

3 Análisis bibliométrico

Se realizó una búsqueda con la estrategia indicada, en el sentido de verificar o identificar todas la referencias bibliográficas cuya fuente corporativa se refiera a la Universidad Central de Venezuela (UCV) en cualquiera de las áreas temáticas de las bases de datos consultadas.

3.1 Producción de la UCV

La búsqueda arrojó un resultado de 178 referencias de las cuales un 75% (134 referencias bibliográficas) se han publicado en el período 1994-2005. A su vez, se observa que el 54% de los documentos son artículos de conferencias y el resto de revistas técnicas; es decir, se observa una distribución casi equitativa en cuanto a tipo de fuente utilizada para difundir o publicar los diversos trabajos.

En la Fig. 1 se muestra la evolución del número de documentos publicados por la UCV en el periodo 1994-2005. Se destaca el año 1996, con el mayor número de publicaciones en el periodo analizado (23 publicaciones), lo cual se explica principalmente porque en ese año se observa en las áreas de geoquímica, geología, ambiente y gas natural, un incremento en el número publicaciones debido a eventos nacionales. En líneas generales, se observa una tendencia variable que muestra promedio creciente en los último años a partir de 1997, sin tomar en cuenta el año 2005, aun por actualizar.

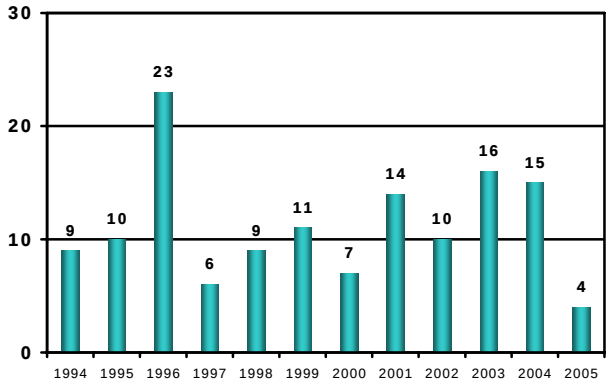


Fig.1 Evolución de las publicaciones de la UCV, 1990-2005

Por otra parte, los resultados de las publicaciones de la UCV en conjunto con otras Universidades nacionales e internacionales se muestra en la Tabla 1.

Tabla 1. Publicaciones de la UCV con otros Universidades, 1994-2005

Universidades	N°
CAMBRIDGE UNIV	4
NIS UNIV	4
ORIENTE UNIV	3
SIMON BOLIVAR UNIV	2
WISCONSIN UNIV, MADISON	2
DURHAM UNIV	1
HERIOT WATT UNIV	1
HOUSTON UNIV	1
MIAMI UNIV, FLORIDA	1
MINN UNIV, MINNEAPOLIS	1
NORTHWESTERN UNIV	1
OTTAWA UNIV	1
PARIS VI UNIV	1
PONTIFICIA UNIV CATOLICA	1
YALE UNIV	1
ZULIA UNIV	1

El número de publicaciones en coautoría con universidades nacionales e internacionales denota una red de comunicación un tanto débil, ya que representa aproximadamente un 18% del total de las publicaciones, de las cuales un 4% corresponde a las universidades nacionales y un 14% a las internacionales.

Desde la perspectiva nacional los investigadores de la UCV han publicado en coautoria con empresas e institutos nacionales en un 40% del total de sus publicaciones, de las cuales un 36% se ha publicado con la empresa petrolera

estatal PDVSA y sus filiales (Tabla 2). Por otra parte, las publicaciones con empresas e institutos internacionales representan el 13% del total.

Tabla 2. Publicaciones de la UCV con otras empresas e institutos, 1994-2005

Empresas e Instituciones	N°
PDVSA	48
GLOBE INST PHYSIQUE	5
SCHLUMBERGER CAMBRIDGE RES	4
HERBAS CONSULT ASOCIADOS	3
COMPUTER MODELLING GRP LTD	2
IVIC	2
BUREAU RECH GEOL MIN (FR)	1
CELANESE	1
CTR ENERGY TECHNL AMERICAS	1
EXXON PRODUCTION RES CO	1
INELECTRA	1
MIRA GEOSCIENCE LTD	1
MONTENEGRO INST GEOL EXPL	1
VANTON RESEARCH LAB INC	1
WATER MGMT TECHNOL GROUP	1
WESTERN ATLAS LOGGING SERV	1

En la Tabla 3 se resume la información por un reordenamiento por áreas, según las principales palabras claves referidas en el tesauro de la base de datos TULSA, y la clasificación general de acuerdo a la cadena de valor del negocio petrolero. El 74% de la información publicada por la UCV en el periodo 1994-2005 se concentra en las cinco primeras áreas de las cuales, un 44% se puede referir como la macro-área de exploración que comprendería las disciplinas de geología, geofísica y geoquímica. Siguen el área de asfaltenos con un 16% e Ingeniería de yacimientos con un 13%.

Tabla 3. Publicaciones de la UCV por áreas, 1994-2005

Areas	N°	%
Geología	33	25
Asfaltenos	22	16
Ingeniería de yacimientos	18	13
Geoquímica	15	11
Geofísica	11	8
Ambiente	9	7
Gas Natural	8	6
Perforación y producción	6	4
Corrosión	5	4
Otros	7	5

La macro-área de producción comprende las disciplinas de ingeniería de yacimientos, perforación y producción, lo cual representa un 17%. Resalta la fortaleza de la UCV en el área de exploración con respecto a producción.

3.2 Análisis por áreas

A continuación se detalla el análisis bibliométrico por áreas temáticas, de acuerdo con la magnitud de las publicaciones referidas en la Tabla 3, donde se destacan la evolución de las publicaciones y los autores con mayor número de publicaciones en el área de estudio.

Para geología, con un total de 33 referencias bibliográficas, se muestra la evolución de las publicaciones en la Fig. 2. En ésta se observa una tendencia casi constante a partir de 1996 al presente, donde se puede inferir un promedio de 2 a 4 publicaciones por año. Con respecto a los autores en esta área destacan ZAPATA E., REY O., PADRON V. con 10 publicaciones cada uno, LORENTE M. A., y MACHADO A. con 9 y 6 publicaciones respectivamente. La Fig. 3 hace referencia gráfica a estos resultados mediante un mapa conceptual. (Véase anexo 5.1 para las referencias respectivas).

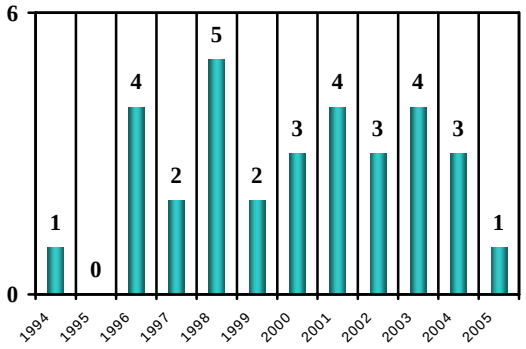


Fig. 2 Evolución de las publicaciones del área de geología, 1994-2005

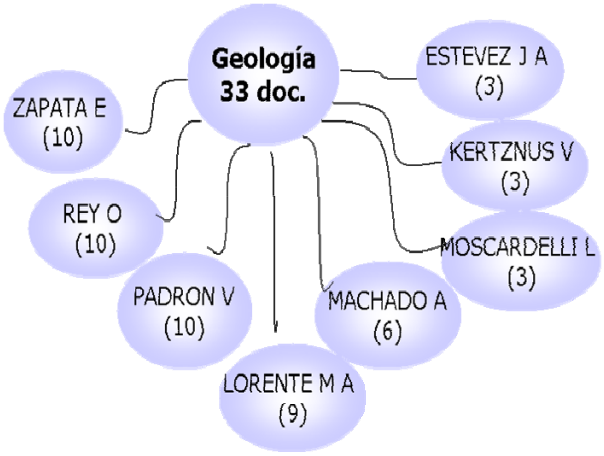


Fig. 3 Autores con mayor número de publicaciones

En la Fig 4 se muestra la evolución de las publicaciones del área de asfaltenos, la cual arroja un total de 22 referencias bibliográficas en exploración y producción; se destacan en color azul oscuro 4 referencias relacionadas al área de refinación pertinente a técnicas espectroscopia o de laboratorio. En resumen se observa una tendencia variable con al menos una publicación por año. Desde la perspectiva de los autores se destacan con el mayor número de publicaciones ACEVEDO S. con 17 publicaciones, RANAUDO M. A. y CASTILLO J con 13 publicaciones, FERNANDEZ A. con 10 y ESCOBAR G. con 7 publicaciones.

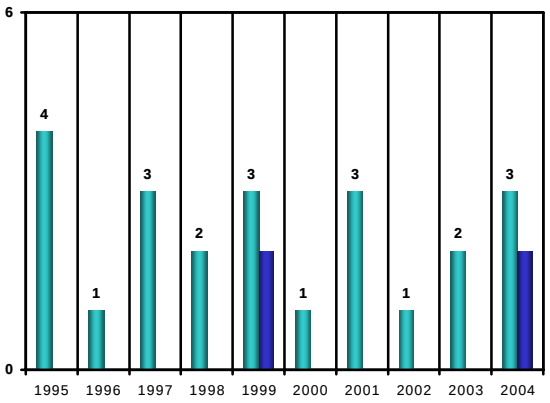


Fig. 4 Evolución de las publicaciones del área de asfaltenos, 1994-2005

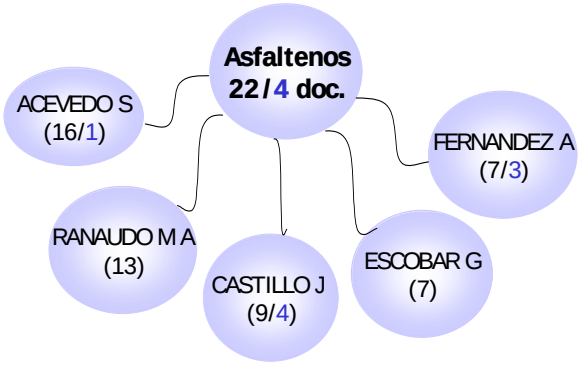


Fig. 5 Autores con mayor número de publicaciones

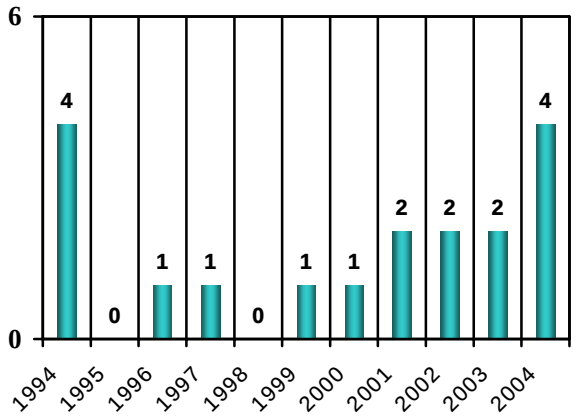
Por otra parte, es importante destacar que estos investigadores han publicado en conjunto. A continuación se señala entre paréntesis el número de documentos publicados: RIZZO A. (2); GARCIA A. (1); ECHEVARRIA L. (1), MENDEZ B. (1), ORTEGA .P (1); GONCALVEZ S. (1); PEREZ P. (1), PATINO P. (1) GUTIERREZ L. B. (2); GUTIERREZ X. (2); CAETANO M. (2); PEREIRA J. C. (2).

El área de ingeniería de yacimientos contiene referencias bibliográficas referentes a trazadores, simulación de yacimientos, métodos de recuperación, "conformance"[11] e información referente al yacimiento, lo cual suma un total de 18 publicaciones. Se observa una tendencia creciente en los últimos año, relativa a artículos relacionados al área de "conformance" (Fig. 6). A su vez, es importante

[11] Aseguramiento del cumplimiento de un aparato con un conjunto definido de requerimientos. http://www.etesters.com/search/product/listAll.cfm/keyword/Conformance_Test.

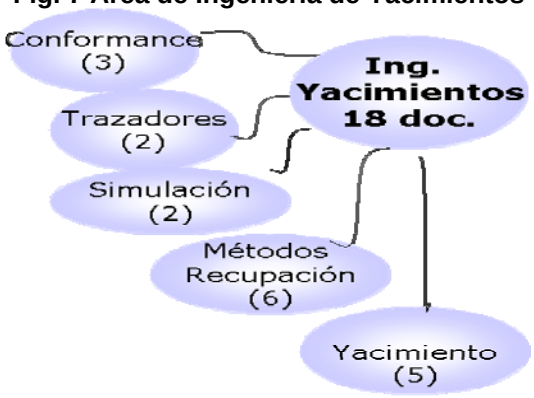
destacar que el 80% de las referencias bibliográficas de esta área han sido difundidas mediante conferencias y en su mayoría en coautoría con empresas como PDVSA y otras. Específicamente no resalta un grupo de autores en área por lo atomizado del conocimiento.

Fig. 6 Evolución de las publicaciones del área de Ingeniería de Yacimientos, 1994-2005



Específicamente en el área de trazadores y simulación resalta GUEVARA-JORDAN J. M. con 4 publicaciones y en el área de "Conformance" los autores HERBAS J.; MORENO R.; ROMERO M. F. con 3 publicaciones, este último docente de la UCV. (Fig. 7)

Fig. 7 Área de Ingeniería de Yacimientos



El área de geoquímica arrojó un total de 15 referencias bibliográficas donde resalta los años 1994 y 1996 con el 60% del total de las publicaciones, para posteriormente decaer el número de publicaciones a una por año (Fig 8). A su vez, en la Fig. 9 se destacan los autores con mayor número de publicaciones en el área,

lo cuales han publicado en coautoría. (Véase anexo 5.1 con las referencias respectivas).

Fig. 8 Evolución de las publicaciones del área de geoquímica, 1994-2005

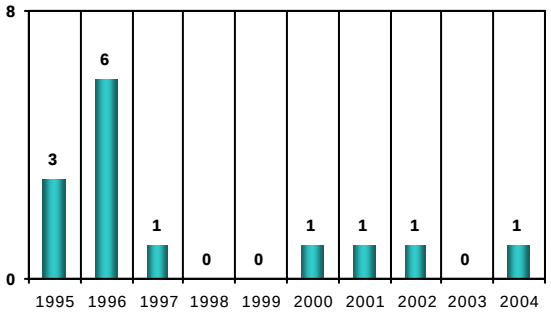
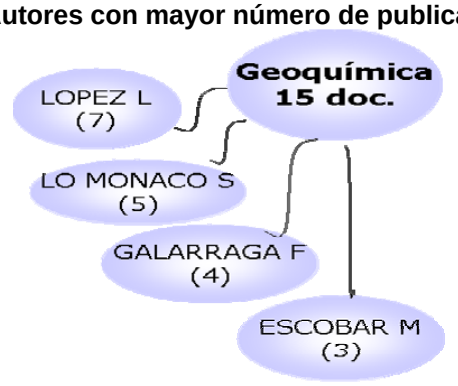
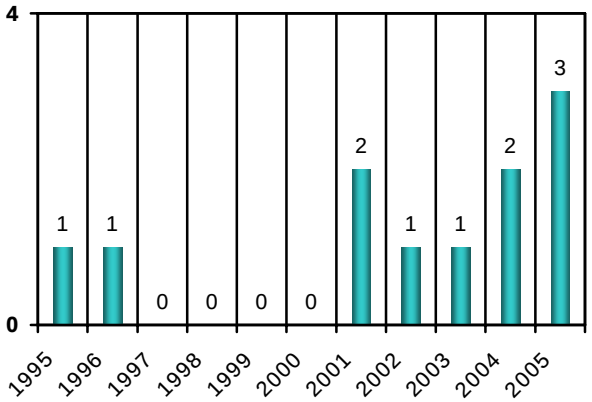


Fig. 9 Autores con mayor número de publicaciones



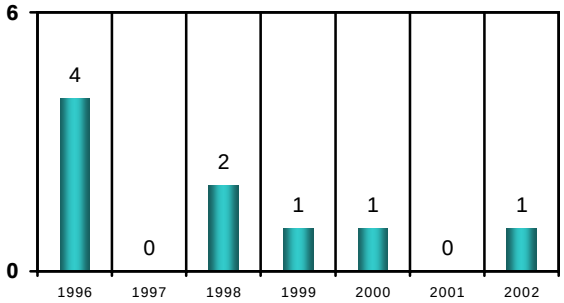
El área de geofísica registra un total de 11 documentos relacionados al área, de los cuales 7 documentos se publicaron en revistas técnicas y el resto en conferencias. A su vez, resalta el Sr. BOSCH M. con 8 publicaciones del total y en la figura siguiente se muestra el número de publicaciones por año. (Véase anexo 5.1 con las referencias respectivas).

Fig. 10 Evolución de las publicaciones del área de Geofisica, 1994-2005



En área de ambiente, relacionada en especial a los derrames petroleros, se observa un total de nueve publicaciones en el periodo 1996-2002, también se muestra una tendencia decreciente (Fig. 11).

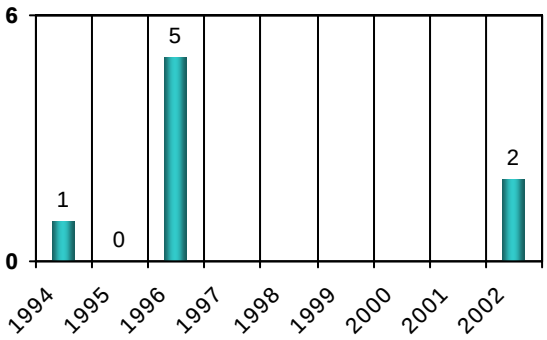
Fig. 11. Evolución de las publicaciones del área de Ambiente



Se destacan los nombres de GARCIA-MARTINEZ R. y FLORES-TOVAR H. con cuatro publicaciones y RODRIGUEZ-MOLINA J. J. con tres publicaciones conjuntamente con otras personas como SAAVEDRA I. (Véase Anexo 5.1).

Para el área de gas natural se encontraron un total de 8 publicaciones con una discontinua en el tiempo y cinco publicaciones en el año 1996. Las recientes publicaciones del año 2002 se refieren al Gas Natural Licuado (GNL), con la particularidad de que la mayoría son relativas al ámbito comercial de gas natural y su cadena de valor.

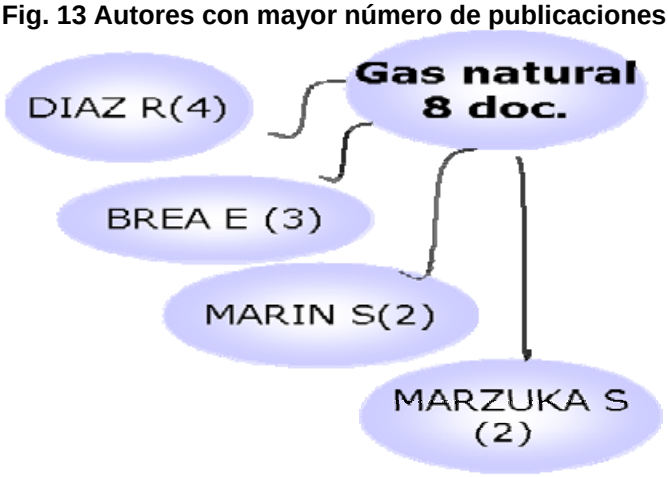
Fig. 12. Evolución de las publicaciones del área de Gas Natural



En esta área un 50% se han publicado en conferencias y los demás en la revista de la Facultad de Ingeniería de la UCV. Se destacan Se destacan los autores

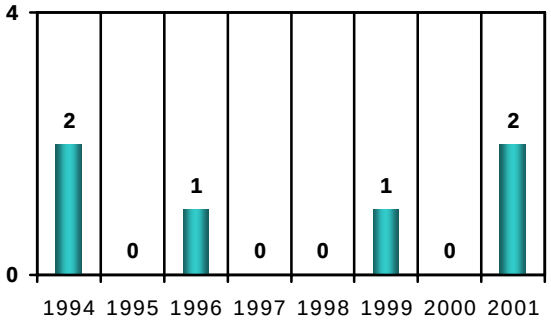
DIAZ R.; BREA E. y MARIN S. con 4, 3 y 2 publicaciones respectivamente, que han publicado en coautoría con UZCATEGUI R. (Corporven). (Fig. 13 y anexo 5.1).

Fig. 13 Autores con mayor número de publicaciones



En la Fig. 14 se muestra el área de perforación y producción con seis referencias bibliográficas, de las cuales 5 se publicaron en conferencias de la SPE y una en la revista de la Facultad de ingeniería de la UCV. Tres artículos son relativos al proceso de perforación, simulación y la gerencia de los desechos de la misma. Otros 2 al proceso de producción, específicamente con inyección de gas; y por último un estudio sobre la interacción roca fluido en el proceso de perforación y cementación, como un caso de estudio.

Fig. 14. Evolución de las publicaciones del área de perforación y producción



Se destacan los siguientes autores con dos publicaciones cada uno, los cuales son GUEVARA J. M., MARTINEZ E. R.; MORENO W J; MORENO J. A. y MAGGIOLO R.

En el área de corrosión destacan con cinco referencias bibliográficas autores PALACIOS C. A. y CHAUDARY V. con 3 y 2 publicaciones respectivamente (anexo 5.1)

Para finalizar, en el área de otros pertinente a exploración y producción, se contemplan todas aquellas referencias bibliográficas que no pudieron ser ubicadas en las áreas previamente descritas (anexo 5.1).

A continuación se muestran los resultados preliminares obtenidos en las áreas de refinación y energías alternas. Tal como se hizo en el área de exploración y producción se consultaron las siguientes bases de datos internacionales:

- Energy Science and Technology,
- EI EncompassLit
- Energy Research

Aplicando la misma estrategia de búsqueda anteriormente señalada, se presenta en la Tabla 4 la clasificacion de las 13 referencias bibliográficas encontradas en el área de refinación, las cuales se detallan en el anexo 5.1, y las 3 referencias bibliográficas relacionas con energías alternas, las cuales se refieren al tema de la biomasa.

Tabla 4. Publicaciones de la UCV en el area de refinación

AREAS	N°	%
Catálisis	7	54
Asfaltenos	4	31
Combustibles	1	7
Otros	1	7

4 Conclusiones y próximos pasos

Como resumen y conclusiones, se puede indicar que:

- En el área de Exploración y Producción petrolera la UCV ha publicado internacionalmente un total de 178 referencias bibliográficas, de las cuales el 75% corresponde al periodo de 1994-2005, es decir, un promedio de 13 publicaciones por año.
- El análisis bibliométrico arroja una coautoria del universo de referencias bibliográficas durante el periodo de 1994-2005 representado por un 40% con empresas o instituciones varias y un 18% con las universidades.
- Específicamente en el sector de la empresa se destaca que casi un tercio de las publicaciones se realizaron con PDVSA y sus filiales.

- Desde la perspectiva de la clasificación por áreas temáticas, se destaca la macro-área de Exploración con un 44% representada por la unión de las disciplinas de Geología, Geoquímica y Geofísica.
- La macro área de Producción representa un 18%, asimilada con la unión de las áreas de ingeniería de yacimientos, perforación y producción.
- Geología y asfaltenos representan casi un tercio del total de las publicaciones, se muestra con una tendencia casi constante, continua y activa, con un promedio de 4 a 2 publicaciones por año respectivamente.
- Las demás áreas muestran una tendencia decreciente y en muchos casos discontinua.

Desde la perspectiva de los próximos pasos se requiere revisar otras bases de datos internacionales (APILIT (954 y 103) y Chemical Abstracts (399))[12] relacionadas al área de refinación y energías alternas para terminar de precisar el escenario del nivel de publicaciones de la UCV en estas áreas.

Específicamente, la base de datos Chemical Abstracts (399) aunque dirigida a las referencias bibliográficas relacionadas al área química básica, contiene muchas de ellas relacionadas al área de petróleo. En principio seria conveniente capturar todo lo publicado en esta base de datos referente al nivel de publicación de la UCV y posteriormente se discriminaría la información.

Un segundo paso se refiere a estructurar una estrategia de búsqueda de información en el ámbito de la documentación interna de la UCV, que permita delinear el nivel correspondiente de producción intelectual de la UCV, relativo al área de energía, para lo cual se sugiere comenzar de lo general a lo particular. Se indican posibles estrategias de búsqueda que se aplicarían separadas o concurrentemente dependiendo de las estructuras de las bases de datos disponibles:

- Una primera aproximación sería buscar en todos los tipos de documentos aquellos relacionados con la palabra energía (en el título, resumen o descriptores si se tienen).
- Otra posible estrategia de búsqueda es verificar en todos los tipos de documentos, los relacionados con las palabras petróleo (petroleum or oil), gas natural (natural gas), carbón (coal) (en el título, resumen o descriptores si los tienen)

[12] El número indicado se refiere al número del archivo que contiene el tipo de información buscado y que hay que proveer al entrar a la base de datos.

- Otra alternativa como estrategia de búsqueda es revisar en todos los tipos de documentos relacionados con las palabras biomasa (biomass); energía eólica o del viento (wind energy); nuclear (nuclear); solar, fotovoltaica (sun o photovoltaic); hídrica (hydropower) y geotérmica (geothermal).

5 Anexos

5.1 Información organizacional sobre la UCV en energía

La Universidad Central de Venezuela (UCV) mediante su enlace virtual nos suministra la siguiente información sobre las Facultades de la UCV a evaluar para el proyecto de Energía:

- Facultad de Ciencias con seis Escuelas y varios Institutos, donde el Instituto de Ciencias de la Tierra sería de interés.
- Facultad de Ingeniería con nueve Escuelas y 4 Institutos.
- Facultad de Humanidades y Educación, específicamente con la Escuela de Geografía
- Facultad de Ciencias jurídicas y políticas con el área de pregrado y postgrado

Con respecto a cada una de las Escuelas de las diversas Facultades pasaremos a señalar su magnitud, estructura organizacional (si se suministra en la pagina web) y el personal señalado en la misma.

En resumen se presenta en la siguiente Tabla 1 un orden de magnitud de la cantidad de docentes de la Facultad de Ciencias por cada una de sus Escuelas. Específicamente en el caso de Biología se señala el personal del Departamento de Ecología que puede ser de interés para el proyecto.

Tabla1. Faculta de Ciencias	
Escuelas	N° Docentes
Biología	123
Computación	38
Física	28
Geoquímica	19
Matemática	88
Química	48
Total	**344**

En la escuela de Biología, el Departemento de Ecología que consta de 35 personas que a continuación se listan:

1. Alex Fergusson (IZT) aferguss@strix.ciens.ucv.ve
2. Alonso Ojeda (IZT) aojeda@strix.ciens.ucv.ve
3. Carlos Monedero (CENAMB) ambitus@cantv.net
4. Claudia Cressa (IBE) ccressa@intercable.net.ve
5. Cruz Salazar (IZT) csalazar@strix.ciens.ucv.ve
6. Diego Rodríguez (IZT) drodrig@strix.ciens.ucv.ve
7. Edie Montiel (IZT) emontiel@strix.ciens.ucv.ve
8. Elizabeth Gordon (IZT) egordon@strix.ciens.ucv.ve
9. Ernesto González (IBE) ejgonzal@strix.ciens.ucv.ve
10. Estrella Villamizar (IZT) evillami@strix.ciens.ucv.ve
11. Eugenia Pereyra (IZT) epereyra@strix.ciens.ucv.ve
12. Evelyn Zoppi de Roa (IZT) ezoppi@strix.ciens.ucv.ve
13. Gerardo Cordero (IZT) gcordero@strix.ciens.ucv.ve
14. Gustavo Villarroel (IZT) gvillar@strix.ciens.ucv.ve
15. Ismael Hernández (IZT) ihernand@strix.ciens.ucv.ve

16. Jesús Alberto León (IZT) jaleon@strix.ciens.ucv.ve

17. Jorge Pérez (IZT) jperez@strix.ciens.ucv.ve

18. José Hernández-Rosas (Esc. Biología) jhernan@strix.ciens.ucv.ve

19. José Luis Berroterán (IZT) jberr@strix.ciens.ucv.ve

20. Laura Delgado (IZT) ldelgado@strix.ciens.ucv.ve

21. Luis Bulla (IZT) lbulla@strix.ciens.ucv.ve Luis Gonzalo Morales (IZT) lmorales@strix.ciens.ucv.ve

23. Marcia Toro (IZT) mtoro@strix.ciens.ucv.ve

24. María Beatriz Barreto (IZT) mbarreto@strix.ci e ns.ucv.ve

25. María Eugenia Grillet (IZT) mgrillet@strix.ciens.ucv.ve

26. María Josefina Hernández (IZT) mjhernan@strix.ciens.ucv.ve

27. Mario Ortaz (IBE) mortaz@strix.ciens.ucv.ve

28. Nora Malaver (IZT) nmalaver@strix.ciens.ucv.ve

29. Paula Spiniello (IZT) pspiniel@strix.ciens.ucv.ve

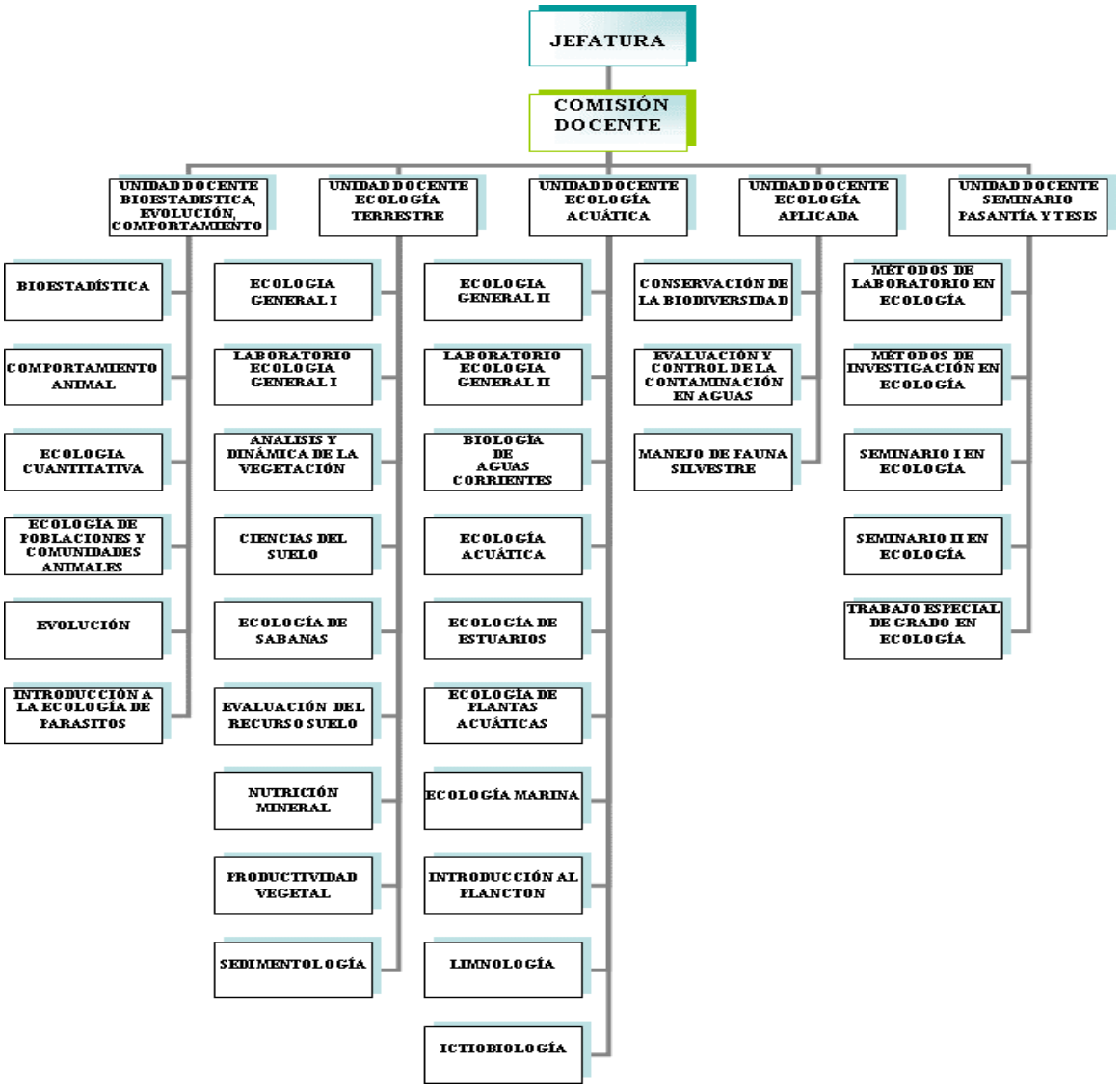
30. Renato De Nóbrega (IZT) rdenobre@strix.ciens.ucv.ve

31. Rubén Candia (IZT) rcandia@strix.ciens.ucv.ve

32. Santiago Ramos (IZT) sramos@strix.ciens.ucv.ve

33. Tatiana Wikander (Esc. Biología) twikande@reacciun.ve 16.Yadira Rangel (IZT) yrangel@strix.ciens.ucv.ve

35. Zaida Tárano (IBE) ztarano@yahoo.com **Fig. 1 Estructura Organizacional del Departamento de Ecología de la Escuela de Biología.**



Por otra parte, también existe el Instituto de la Ciencia y Tecnología de Alimentos (ICTA), el Instituto de Zoología Tropical (IZT) y el Instituto de Biología Experimental (IBE).

La Escuela de Geoquímica consta de 19 docentes, los cuales son:

1. Carrillo Pereira, Eduardo
2. Castillo Figuera, Marco Antonio
3. Darias Rojas, Marly Del Valle
4. Fernández Malave, Raiza Del Valle
5. González Nieto, César Esau

6. Gutiérrez Martín, José Vicente
7. Lo Mónaco Trupiano, Salvador
8. López , Liliana
9. Lugo Uzcátegui, Patricia María
10. Marrero Clemente, Santiago Abraham
11. Martínez Santana, Manuel
12. Médez Baamonde, José María
13. Meléndez Rodríguez, Williams Gregorio
14. Méndez Cegarra, Emerita Consuelo
15. Montero Mudarra, Ramón Luis
16. Quintero Araujo, Felipe Rasvell
17. Ramírez Rojas, Armando José
18. Tapia , Jhonny José
19. Vera Basolo, Oswaldo José

El Instituto de Ciencias de la Tierra (I.C.T) está dedicado a realizar actividades de investigación y docencia especializada en el campo de las Ciencias de la Tierra, contemplando el desarrollo de estas ciencias, su aplicación a problemas de interés nacional, su interacción con las demás Ciencias Naturales y la formación de recursos humanos en áreas específicas: docencia, investigación, innovación, extensión y asesoría. A través de sus Centros de investigación (Centro de Geoquímica, Geología y Geofísica), el Instituto de Ciencias de la Tierra ofrece a todos los profesores de la Universidad Central de Venezuela, un lugar común para realizar sus investigaciones en el campo de las Ciencias de la Tierra en un ambiente interdisciplinario. http://gea.ciens.ucv.ve/~webict/

Se suministra la estructura organizacional del ICT (Fig. 2) y se señala su personal de 25 personas.

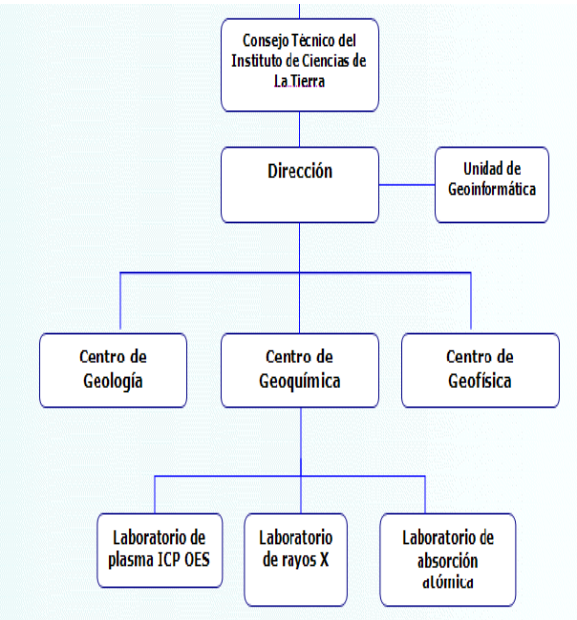


Fig. 2 Estructura organizacional de ICT

Escuela de Física

1. Alonso Hernandez, Vidal Saturnino
2. Arias Gonzalez, Pio Jose
3. Bellorin Rodríguez, Alberto José
4. Bessega Lodi, Maria Carolina
5. Cortina Cuervo, Luis Vicente
6. D Onofrio de Rojas, Lisseta Maria
7. De Vincenzo Moreno, Salvatore
8. Di Prisco de Herrera, Alicia
9. Dunia Amair, Emery Richard
10. Embaid Embaid, Boutros Pierre

11. Font Villarroel, Anamaria
12. Fuenmayor Di Prisco, Ernesto
13. Gago Bousquet, Carlos Eduardo
14. Gamez Ortega, Sonia
15. Gonzalez de Armengol, Gema
16. Guevara Baro, FernandoHurtado Villasana, Nuri Janil
18. Jaimes Caicedo, Edgar
19. Leal Brizuela, Lorenzo
20. Lozada Gutierrez, Abraham
21. Marcano Della Casa, Alfredo José
22. Martín Landrove, Rafael
23. Michinel Machado, José Luis
24. Quiñones Loubet, Jackeline Josefina
25. Rodríguez Cruz, Zahily Ivette
26. Rojas Gutierrez, Carlos Eduardo
27. Rojas Mujíca, Humberto LuisVarela Vizcarrondo, Victor

La **Facultad de Ingeniería** consta de las siguientes escuelas (Tabla 2), de las cuales serían de interés las escuelas de Ing. Eléctrica, Ing. Geología, Minas y Geofísica, Ing. Mecánica (Dpto. de Energética) e Ing. de Petróleo e Ing. Química. Específicamente el personal del Departamento de Geología consta de 26 docentes, señalados a continuación:

1.Albrizzio, C. Geólogo, U.C.V.

2.Alezones, R. Ingeniero Geólogo, U.C.V.

3.Audemard, F. Ingeniero Geólogo, U.C.V. (1985) ; Ph. D Universite de Montepellier II (1993)

4.De Santis, F

5.Diaz, A..

6.Falcón, R.

7.Grande, S.

8.Gregoriev, D. Geólogo, University of Miami

9.Mederos, A.

10.Geólogo, U.C.V.

11.Mendez, J.

12.Mendez O.

13.Ingeniero Geólogo, U.C.V. (1965)

14.Mora, J. Ingeniero Geologo, U.C.V. (1976); M.Sc. State University of N.Y. at Albany (SUNYA)

15.Motiscka, P. Geólogo, U.C.V. (1964); Ph.D Basilea Université (1970)

16.Lorente, M. A. Ingeniero Geólogo, U.C.V. (1978); M.sc. Geología Sedimentaria, U.C.V (1983); Ph. D Universidad de Amterdam (1987)

17.Ostos, M. Ingeniero Geólogo, U.C.V. (1978); M. A. Rice University (1984); Ph. D. Rice University (1990)

18.Padrón, V.

19.Rey, O Ingeniero Geólogo, U.C.V; M.Sc. U.C.V(1990)

20.Rodriguez, A.

21.Rojas, O.

22.Romero, P Ingeniero Geólogo, U.C.V (1996)

23.Sandoval, M. E.

24.Scherer, W. Geólogo U.C.V.(1965); Ph. D Northwestern University, Chicago, USA (1973)

25.Singer, A.

26.Winkler, V. Ab/Bs Illinois University(1938); M.Sc. Illinois (1939); PhD. Illinois (1941)

Tabla 2. Faculta de Ingeniería		
Escuelas	**N°**	**Profes.**
Ingeniería Civil		**98**
Ingeniería Eléctrica		**49**
•Departamento de Comunicaciones		19
•Depatamento de Electrónica		17
•Departamento de Potencia		13
Ingeniería Geología, Minas y Geofísic		**46**
•Departamento de Geología		26
•Depatamento de Geofísica		20
•Departamento de Minas???		
Ingeniería Mécanica		**0**
•Departamento de Energética		
•Departamento de Diseño		
•Departamento de Tecnología y Producción		
•Departamento de Automática		
Ingenería Metalurgía y Ciencias de los mate		**25**
•Dept. Metalurgía química(12)		12
•Dept. Metalurgía Física (13)		13
Ingeniería de Petróleo		**27**
Ingenería Química		**37**
•Diseño y Control de Procesos		16
•Termodinámica y Fenómenos de Transporte		21
Total		**255**

El Departamento de Geofísica consta de 20 personas docente, las cuales son las siguientes:

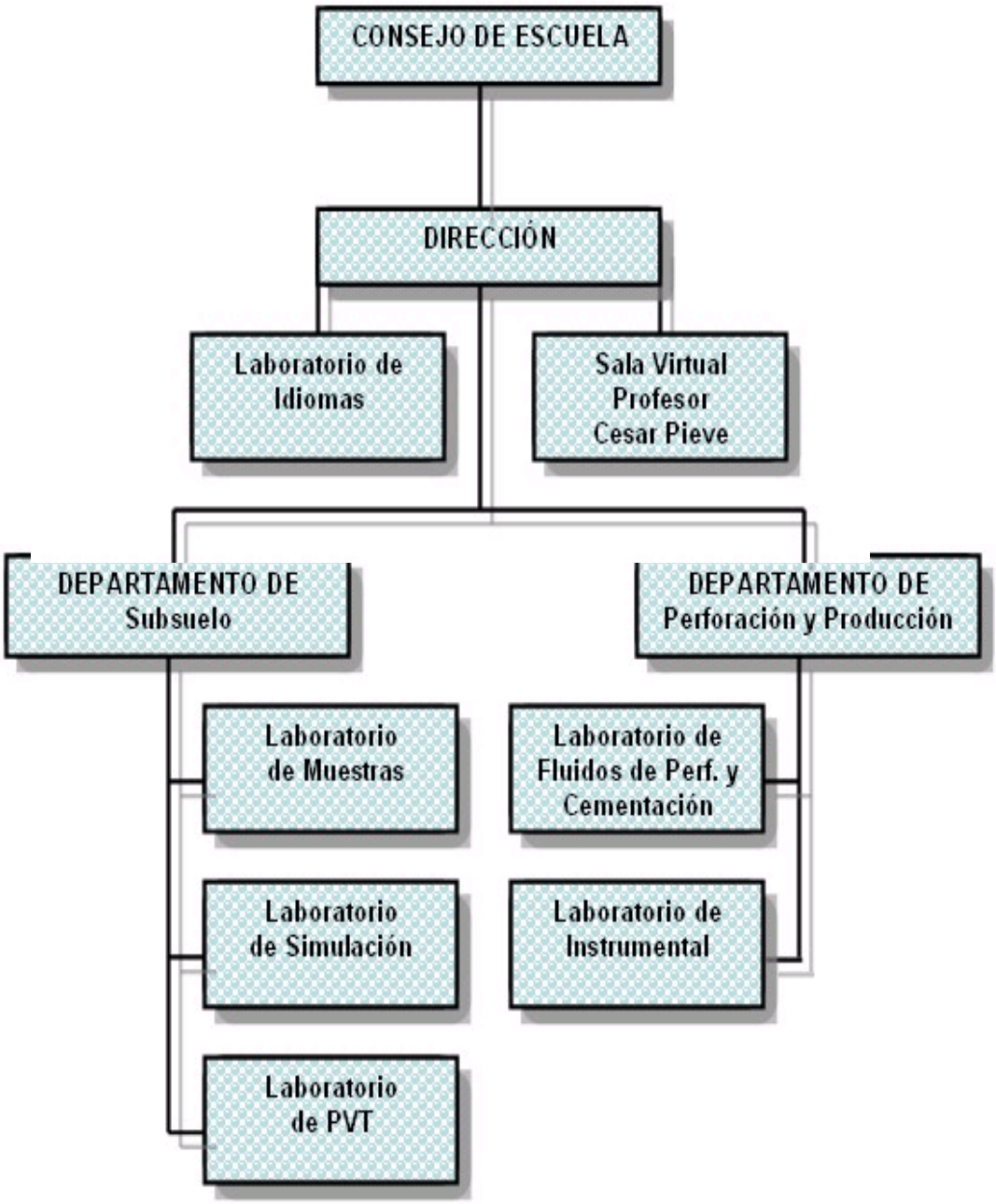
Nombre y Apellidos	Profesión	Línea de Investigación
Inírida Rodríguez (Jefe Dpto.)	Msc. Geofísica	Métodos Gravimétrico y Magnéticos
Marco Figueroa	Msc. Física	Sismología y Geofísica Matemática
Nuris Orihuela Guevara	Msc. Geofísica	Métodos Gravimétricos y Magnéticos
José Manuel Cavada	Ing. Geofísico	Geomatemáticas, Geofísica Computacional y Métodos Sísmicos.
Gustavo Malavé	Dr. Sismología	Sismología y Geotecnia
Raúl Torres	Lic. Física	Adquisición de datos Sísmicos
Juan José Infante	Msc. Geofísica	Geofísica Matemática y Procesamiento de Datos Sísmicos

Andrey Ortega	Dr. Geofísica	Inversión Sísmica
María Gabriela Castillo V.	Ing. Geofísico	Interpretación Sísmica y Tectónica
Arturo Contreras	Ing. Geofísico	Física de Rocas
Hugo Castellanos	Ing. Geofísico	Estratigrafía Secuencial e Interpretación Sísmica
Henry Salas	Ing. Geofísico	Geofísica Planetaria y Métodos Varios
Rómulo Carmona	Ing. Geólogo	Petrofísica de Producción
Antonio Feijoo	Msc. Geofísica	Procesamiento de Datos Sísmicos
Eugenio Galovich	Ing. Geólogo	Métodos Eléctricos, Sísmica de Refracción y Geotecnia
Orlando Méndez	Ing. Geólogo	Geología de Producción y Gerencia de Yacimientos
Pedro León	Msc. Geofísica	Interpretación Estructural y Estratigrafía Secuencial
Ronny Meza	Ing. Geofísico	Modelado de Cuenca, Geofísica de Exploración y Geoestadística
Edixón Marques	Ing. Geodesta	Prospección Geofísica
Yamirel Jaspe	Secretaria	Cursando 8vo. Semestre de Comunicación Social

Con respecto a la Escuela se Minas no se suministra detalles por no estar aun disponibles en la página web.

Con respecto a la Escuela de Ingeniería de Petróleo se observa nombre y descripción breve de Resumen de lo c/u de los 27 profesores que conforman el equipo docente, pero no se puede copiar la información (por verificar en otra fuente de la escuela) pero se anexa la estructura organizacional de la misma en la Figura

Fig. 3 Organigrama de la Escuela de Petróleo.



5.2 Referencias encontradas por temática

5.2.1 Exploración y producción

5.2.1.1 Ambiente

COMPUTER MODELING OF OIL SPILL TRAJECTORIES WITH A HIGH ACCURACY METHOD
GARCIA-MARTINEZ R; FLORES-TOVAR H
VENEZUELA CENTRAL UNIV
SPILL SCI TECHNOL BULL V 5, NOS 5-6, PP 323-330, JUNE 2000

This paper proposes a high accuracy numerical method to model oil spill trajectories using a particle-tracking algorithm. The Euler method, used to calculate oil trajectories, can give adequate solutions in most open ocean applications. However, this method may not predict accurate particle trajectories in certain highly non-uniform velocity fields near coastal zones or in river problems. Simple numerical experiments show that the Euler method may also introduce artificial numerical dispersion that could lead to overestimation of spill areas. This article proposes a fourth-order Runge-Kutta method with fourth-order velocity interpolation to calculate oil trajectories that minimize these problems. The algorithm is implemented in the OilTrack model to predict oil trajectories following the "Nissos Amorgos" oil spill accident that occurred in the Gulf of Venezuela in 1997. Despite lack of adequate field information, model results compare well with observations in the impacted area. (c2000 Elsevier Science Ltd.)

MATHEMATICAL MODEL TO SIMULATE UNSTEADY FLOW IN GAS PIPELINES WITH CONDENSATION (MODELO MATEMATICO PARA SIMULAR FLUJO NO-PERMANENTE EN GASODUCTORS DONDE OCURRE CONDENSACION)

GARCIA-MARTINEZ R; MATA L J
VENEZUELA CENTRAL UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 11, NO 1, PP 25-33, 1996

This work describes a mathematical compositional model to simulate 2-phase flow in gas pipelines with condensation. Algorithms that consider variable physical gas properties as a function of the gas composition are formulated. A model to calculate condensation of gas components is incorporated to the model. Results of various test cases show that the evolution of the holdup is linear in time periods simulated. However, this behavior may not be generalized to high holdup sections since liquid obstruction leads to changes in pressure and mass transfer rates in the gas-liquid interface may show a nonlinear time evolution. The proposed model may be used to simulate slow time varying gas flow and could be a useful tool to study liquid removal methods in gas pipelines.

OILTRACK(TM): A COMPUTATIONAL MODEL TO SIMULATE OIL SPILLS TRAJECTORIES IN WATER

GARCIA-MARTINEZ R; RODRIGUEZ-MOLINA J J
VENEZUELA CENTRAL UNIV
DEVELOPMENT AND APPLICATION OF COMPUTER TECHNIQUES TO ENVIRONMENTAL STUDIES VI (ENVIROSOFT 96 (COMO, ITALY, SEPT 1996) PROC) PP 705-715; COMPUTATIONAL MECHANICS PUBLICATIONS, 1996

This article describes the OilTrack(TM) mathematical model to simulate oil spills trajectories in water. The model calculates the 2-D velocity field in the spill zone and simulates the oil spreading on the water surface. A graphical user interface (GUI) that runs under MS-Windows(TM) makes the model accessible to professionals with little computer training. Comparisons with analytical solution, laboratory experiments, and various spreading formulations show that OilTrack(TM) is an accurate and useful tool to study the oil trajectory from instantaneous or continuous spill accidents. OilTrack(TM) can be used for water pollution contingency planning and for performing environmental impact assessments.

A CORRECTION TO THE MACKAY OIL SPREADING FORMULATION

GARCIA-MARTINEZ R; MATA L J; FLORES-TOVAR H
VENEZUELA CENTRAL UNIV
19TH ENVIRON CAN ARCTIC & MAR OILSPILL PROGRAM TECH SEMINAR (CALGARY, CAN, 6/12-14/96) PROC V 2, PP 1627-1635, 1996

Most mathematical models available to simulate the behavior and trajectory of oil spills on the water use the Mackay et al. formulation, which predicts the time evolution of the oil surface area. The accurate calculation of the area that the oil slick occupies is of fundamental importance, since it determines evaporation and other important phenomena that affect oil property changes and the spill impact on the environment. This work presents a critical analysis of the Mackay formulation starting from the original theory. It is shown that Mackay constants (Ak and Bk) are not universal. Moreover, it is demonstrated that they are not constants but variables, depending on oil and water physical properties, and consequently should be evaluated for each particular oil spill. The formulation developed is compared with laboratory experiments for the case of spreading on a quiescent water surface. Results show that the proposed formulation gives more realistic results. This analysis should be of interest to those developing and using models to simulate oil spills.

ORITRACK(TM). A MATHEMATICAL MODEL FOR ORIMULSION(TM) SPILLS IN WATER

GARCIA-MARTINEZ R; RODRIGUEZ-MOLINA J J; CAMACHO F; MASCIANGLIOLI P
VENEZUELA CENTRAL UNIV; INTEVEP SA
19TH ENVIRON CAN ARCTIC & MAR OILSPILL PROGRAM TECH SEMINAR (CALGARY, CAN, 6/12-14/96) PROC V 1, PP 857-868, 1996 (13 REFS) , 1996

The ORITRACK(TM) mathematical model to simulate ORIMULSION(TM) spills in water is discussed. ORIMULSION(TM) is a low viscosity emulsion of heavy oil-in-water developed by the Venezuelan oil industry. This emulsion may be transported by pipelines and ships and burnt for electric energy generation in a competitive manner. The model calculates the 2-D velocity field in the spill zone and simulates the emulsion dispersion in the 3-D space. Comparisons with analytical solution and field spill tests are presented. A graphical user interface makes the model accessible to professionals with little computer training. ORITRACK(TM) is a useful tool to study the ORIMULSION(TM) trajectory and fate from instantaneous or continuous spill accidents in fresh or salt water.

EDAFIC AND SUCCESSIONAL CHANGES GENERATED BY DRILL WASTES APPLICATION IN ACID-SULFATE SOILS AT THE UPPER ORINOCO DELTA

VASQUEZ P; URICH J; RODRIGUEZ A; LOPEZ C; GONZALEZ V; MARCANO J; COLOMBO P
PETROLEOS VENEZUELA SA; VENEZUELA CENTRAL UNIV
SPE HEALTH, SAFETY & ENVIRON IN OIL & GAS EXPLOR & PROD INT CONF (CARACAS, VENEZUELA, 6/7-10/98) PROC 1998, SPE-48922

Since 1995, PDVSA environmental management policies for oil exploration and production activities have encouraged research in order to safely dispose of drill cuttings (DC) in previously drained and consequently acidified wetland soils from the Orinoco upper delta. These soils with pH < 3.5, high exchangeable Al (> 15 meg/100 g), and low saturation of exchangeable bases (Ca, Mg), are commonly colonized by Cyperaceae weeds. In a field experiment located nearby Varadero de Manamo (Monagas state), the addition and tillage of DC in concentrations ranging from 200 to 1,000 cu m/ha produced total reduction of exchangeable Al, as well as pH increase in the range of 5.6 to 6.9. During 2 yr, floristic and successional changes were evaluated. A progressive substitution of the non-palatable sedge cover by useful cattle and wildlife species (Leersia hexandra, Paspalum conjugatum, Oryza rufipogon, Cassia occidentalis, Cassia tora and Axonopus sp.) was observed.

EXPERIMENTAL MEASUREMENT OF OIL SPILL SPREADING IN A WAVE TANK USING DIGITAL IMAGE PROCESSING

ANDREATTA A; LLONA G; SAAVEDRA I; FLORES H
SIMON BOLIVAR UNIV; CENTRAL VENEZUELA UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 14, NO 2, PP 113-118, 1999

An experimental study of spreading of crude oil is carried out in a wave tank. The tests are performed by spilling different volumes and types of crude oil on the water surface. An experimental measurement technique was developed based on digital processing of video images. The acquisition and processing of such images is carried out by using a video camera and inexpensive microcomputer hardware and software. Processing is carried out by first performing a digital image filter, then edge detection is performed on the filtered image data. The final result is a file that contains the coordinates of a polygon that encloses the observed slick for each time step. Different types of filters are actually used in order to adequately separate the color intensities corresponding to each of the elements in the image. Postprocessing of the vectorized images provides accurate measurements of the slick edge, thus obtaining a complete geometric representation, which is significantly different from simplified considerations of radially symmetric spreading. The spreading of the oil slick was recorded for each of the tests. Results of the experimental study are presented for each spreading regime and analyzed in terms of the wave parameters such as period and wave height.

MEASUREMENTS OF OIL SPILL SPREADING IN A WAVE TANK USING DIGITAL IMAGE PROCESSING

FLORES H; SAAVEDRA I; ANDREATTA A; LLONA G
VENEZUELA CENTRAL UNIV; SIMON BOLIVAR UNIV
OIL AND HYDROCARBON SPILLS, MODELLING, ANALYSIS AND CONTROL (1ST WESSEX INST TECHNOL ET AL INT CONF (OIL SPILL 98) (SOUTHAMPTON, UK, 7/29-31/1998) PROC) PP 165-173; COMPUTATIONAL MECHANICS PUBLICATIONS, 1998

An experimental study of the spreading of spilled crude oil was conducted in a wave tank. The tests were performed by spilling different volumes and types of crude oil on the water surface. An experimental measurement technique was developed based on digital processing of video images. The acquisition and processing of such images were carried out using a video camera and microcomputer hardware and software. Processing was carried out by performing a digital image filter, and then edge detection on the filtered image data. The final result is a file that contains the coordinates of a polygon that encloses the observed slick for each time step. Different types of filters were used to adequately separate the color intensities corresponding to each of the elements in the image. Post-processing of the vectorized images provided accurate measurements of the slick edge, thus obtaining a complete geometric representation that is significantly different from simplified considerations of radially symmetric spreading. The spreading of the oil slick was recorded for each of the tests. Results of the experimental study are presented for each spreading regime and analyzed in terms of wave parameters such as period and height.

COMPRESSIBLE AIR FLOW THROUGH PERFORATED SUBMERGED PIPES FOR PNEUMATIC BARRIER GENERATION (FLUJO COMPRESIBLE DE AIRE A TRAVES DE TUBERIAS SUMERGIDAS PERFORADAS PARA GENERAR BARRERAS NEUMATICAS)

BASELICE A; FALCON M; ALONSO M
VENEZUELA CENTRAL UNIV; *REV FAC ING (VENEZUELA CENT UNIV) V 17, NO 1, PP 105-117, 2002*

Bubbler systems consist of a compressor that supplies air to a submerged pipe (or pipes) perforated with millimetric orifices, through which air escapes and gives rise to an ascending plume. The corresponding motion of the receiving water body serves to increase mixing for destratification and for use of generated surface velocities as a pneumatic barrier. The design of horizontal perforated pipes with inclined extremes (such as might be laid upon a submerged, trapezoidal, dredged navigation channel) in order to achieve an overlying pneumatic barrier with constant surface velocities is described. The thermodynamics of the air flow is inherent to the calculations, and it was found that generally the flow within the pipe is subsonic. However, flow through the orifices of the extreme pipe, owing to reduced depths, can become supersonic. Off-design operation is also calculated. Oil spill control is one suggested use for the bubbler system.

5.2.1.2 Asfaltenos

STRUCTURAL ANALYSIS OF SOLUBLE AND INSOLUBLE FRACTIONS OF ASPHALTENES ISOLATED USING THE PNP METHOD. RELATION BETWEEN ASPHALTENE STRUCTURE AND SOLUBILITY
ACEVEDO S; ESCOBAR O; ECHEVARRIA L; GUTIERREZ L B; MENDEZ B
VENEZUELA CENTRAL UNIV
ENERGY FUELS V 18, NO 2, PP 305-311, MARCH-APRIL 2004
Both the toluene-insoluble (A1) and toluene-soluble (A2) asphaltene fractions isolated using the PNP method have been characterized by elemental analysis, molecular weight (VPO (vapor pressure osmometry), SEC (size-exclusion chromatography) and LDMS (laser desorption mass spectroscopy)), and NMR (nuclear magnetic resonance) (1H and 13C). The most prominent results of the analysis were the differences in hydrogen aromaticity fH, high content in both fractions of hydrogen bonded to aliphatic carbons joined to aromatics (f(alpha)), and differences in carbon aromaticity fC. Thus, low fH and high f(alpha) in A1 were consistent with a single, rigid, and flat core formed by fusion of single, large polycyclic aromatic and naphthenic units (PANU), whereas for A2, high fH and high f(alpha) were consistent with a more flexible structure where several smaller PANU are joined by aliphatic chains. Using an MM (molecular mechanics) program, models for A1 and A2 were built, and the solubility parameters calculated were found in keeping with solubility difference suggesting that the above structural differences account for the solubility difference. Similar molecular weight and heteroatom content found for these fractions suggest that these play a minor or insignificant role in solubility. A dispersion mechanism of A1 by A2, relevant to solubility of asphaltene in organic solvents, is proposed.

ADSORPTION OF ASPHALTENES AT THE TOLUENE-SILICA INTERFACE: A KINETIC STUDY
ACEVEDO S; RANAUDO M A; GARCIA C; CASTILLO J; FERNANDEZ A
VENEZUELA CENTRAL UNIV
ENERGY FUELS V 17, NO 2, PP 257-261, MARCH-APRIL 2003
The adsorption kinetics of asphaltenes at the toluene-silica interface has been measured for nine solution concentrations CS (from 5 to 3,000 mgL-1). Results could be adjusted to an irreversible, second-order adsorption kinetics, where the adsorption rate k was strongly dependent on concentration. Thus, a large reduction in k was observed when CS was increased in the studied concentration range. This rate reduction was accounted for in terms of adsorption of aggregates formed in solution. The stepwise trends observed for the adsorption isotherms of asphaltenes on mineral surfaces were reproduced using the above k values.

SIMPLE METHOD FOR ACCURATE DETERMINATION OF ASPHALTENE PRECIPITATION
SHEU E Y; ACEVEDO S
VANTON RESEARCH LAB INC; CENTRAL VENEZUELA UNIV; *225TH ACS NAT MTG (NEW ORLEANS, LA, 3/23-27/2003) PAP; BOOK OF ABSTR (ACS) PT 1, ABSTR NO GEOC 144, 2003*

AGGREGATION AND ADSORPTION OF ASPHALTENES: A KINETICS STUDY
ACEVEDO S; RANAUDO M A; GARCIA C; CASTILLO J; FERNANDEZ A
VENEZUELA CENTRAL UNIV
224TH ACS NAT MTG (BOSTON, MA, 8/18-22/2002) PAP; BOOK OF ABSTR (ACS) PT 1, ABSTR NO FUEL 48, 2002

IMPORTANCE OF ASPHALTENE AGGREGATION IN SOLUTION IN DETERMINING THE ADSORPTION OF THIS SAMPLE ON MINERAL SURFACES
ACEVEDO S; RANAUDO M A; GARCIA C; CASTILLO J; FERNANDEZ A; CAETANO M; GONCALVEZ S
CENTRAL VENEZUELA UNIV
COLLOIDS SURFACES, SECT A V 166, NOS 1-3, PP 145-152, 6/15/2000
Adsorption rate constants and adsorption isotherms on silica have been obtained for toluene solutions of Furrial asphaltenes. For initial solution concentrations of 5, 20 and 50 mg l-1 an adsorption rate proportional to solute concentration was observed with an average first order rate constant of (1.17 (+-) 0.3) 10 E-03 min-1. For more concentrated solutions (200 and 400 mg l-1), we found the same initial rate constant. However, at long times significant lower rates were apparent. We found that desorption of asphaltenes from the surface was very slow and could be neglected. Also, we found that the adsorption isotherms, measured for solution concentrations (Cs) below 500 mg l-1, changed with time over a period of days where adsorption on the surface ((nu)) grows slowly over time. A slow tendency from L-type to H-type was observed for the adsorption isotherms measured at 18, 48, and 96 h. Under the conditions of concentration and time examined, these results are consistent with the formation of asphaltene multilayer at the silica surface and with the adsorption of aggregates (dimers, timers, etc.) as well as single asphaltene molecules. In view of these results we suggest that for solutions concentration below 50 mg l-1, small aggregates are adsorbed on the surface at a rate similar to the single molecules until the silica surface is covered or saturated.

INTERFACIAL PROPERTIES OF THE PRODUCTS OF OZONOLYSIS OF HAMACA CRUDE OIL
ESCOBAR G; PATINO P; ACEVEDO S; ESCOBAR O; RANAUDO M A; PEREIRA J C
VENEZUELA CENTRAL UNIV
ISCOP CONF (HUATULCO, OAXACA, MEXICO, 11/14-17/1999) PROC; PETROL SCI TECHNOL V 19, NOS 1-2, PP 107-118, JAN-FEB 2001

A sample of extra-heavy Hamaca crude oil, dissolved in carbon tetrachloride, was oxidated with ozone for a few minutes. The reaction mixture was washed with a concentrated solution of HCl, neutralized with sodium carbonate, and the products were extracted from the aqueous phase. The products were characterized by using gel permeation chromatography (GPC), elemental analysis, 1H nuclear magnetic resonance (NMR), and Fourier transformed infrared (FTIR) techniques. The results of the analyses show that the products have lower molecular weights, lower aromatic character, and higher oxygen content than the original sample. They also indicated that these products were mainly carboxylic acids, aldehydes, and/or ketones, with a higher affinity for water than for carbon tetrachloride, the organic solvent that was used. Interfacial tension (gamma) measurements (water-toluene) performed with these products showed a linear dependence with concentration, where (gamma) dropped from 32 to ca 7.7 dynes/cm at the apparent critical micelle concentration (cmc) (2 g/L). Preliminary results suggest that these oxidated products could be employed as general surfactants in the oil industry.

NEW TECHNIQUES AND METHODS FOR THE STUDY OF AGGREGATION, ADSORPTION, AND SOLUBILITY OF ASPHALTENES. IMPACT OF THESE PROPERTIES ON COLLOIDAL STRUCTURE AND FLOCCULATION

CASTILLO J; FERNANDEZ A; RANAUDO M A; ACEVEDO S; VENEZUELA CENTRAL UNIV

ISCOP CONF (HUATULCO, OAXACA, MEXICO, 11/14-17/1999) PROC; PETROL SCI TECHNOL V 19, NOS 1-2, PP 75-106, JAN-FEB 2001

The solubility of Furrial asphaltene in toluene was 57 g L-1. However, using a new technique, based on the precipitation of this sample by the phenol PNP (para-nitrophenol), it was found that a fraction, comprising 47% of the asphaltene, is of low solubility. This suggested that this material constitutes the colloidal phase, and the rest acts as the dispersing fraction. This technique allowed the fractionation of asphaltenes in fractions A1, A2, and A3 according to solubility, going from practically insoluble (A1) to low (A2, 1 g L-1) to high (A3, ca 57 g L-1). The adsorption isotherms of asphaltenes on glass and silica in toluene consist of a sequence of steps or step-wise adsorption. The very slow changes with time and the negligible desorption from the surface measured for the isotherms were interpreted as the effect of packing or the building up of a well packed layer. The results and ideas were used to improve the models for asphaltene and petroleum colloids and to underscore the importance of surfaces and colloid dispersants in asphaltene precipitation during the production of crude oils

THERMO-OPTICAL STUDIES OF ASPHALTENE SOLUTIONS: EVIDENCE FOR SOLVENT-SOLUTE AGGREGATE FORMATION

ACEVEDO S; RANAUDO M A; PEREIRA J C; CASTILLO J; FERNANDEZ A; PEREZ P; CAETANO M

VENEZUELA CENTRAL UNIV

FUEL V 78, NO 9, PP 997-1003, JULY 1999

Thermo-optical diffusivities, D, were measured for Hamaca, Cerro Negro and Furrial asphaltenes in both toluene and tetrahydrofuran. In toluene, a plot of D vs. log c where c was the asphaltene concentration, afforded an unexpected minimum near 50 mg l-1. Similar plots in THF for Hamaca asphaltenes yielded the result with little or no change in D with concentration changes. The reduction in D before the minimum (c < 50 mg l-1 in toluene) is consistent with the trapping of a layer of solvent between solute molecules (sort of solute-solvent aggregates) presumably resulting in a higher heat capacity for the solvent in this aggregate when it is compared with the solvent in the bulk. At higher concentrations, and probably because of the collapse of the solute-solvent aggregates and the formation of solute-solute aggregates (dimers, trimers, etc.), solvent is released to the bulk, leading to increases in D until a fairly constant value is reached near 2000 mg l-1. (c1999 Elsevier Science Ltd.)

ALKALINE SYSTEMS: THE ROLE OF THE COUNTERION IN THE AQUEOUS PHASE

ACEVEDO S; RANAUDO M A; ESCOBAR G; GUTIERREZ X; VENEZUELA CENTRAL UNIV

FUEL V 78, NO 3, PP 309-317, FEB 1999

The dynamic behaviour of the interfacial tension at the oil-water interface (gamma)(t) for oleic acid and a 90% v/v Cerro Negro-xylene solution had been studied under alkaline conditions. For the system oleic acid in paraffin, aqueous sodium carbonate with or without added sodium chloride, the usual (gamma)(t) behaviour was observed, i.e. (gamma) drops to low or ultralow values at short times, remains low during a short period, and then rises to high (> 1 N M-1) values. However, when alkyl amines (ethyl, diethyl and triethyl amine) were used as alkalis in the aqueous phase, (gamma)(t) first dropped to a relatively high value (1.5 < (gamma) < 3 N m-1) and then remained almost constant afterwards. The presence of sodium chloride in the aqueous phase was required to observe the aforementioned usual (gamma)(t) behaviour. From these results it is clear that the presence of sodium ions is esential for both reducing (to very low values) and increasing (gamma)(t). It is suggested that ultralow transient values and the formation of spontaneous emulsion are due to a phase inversion (from w/o to o/w) going through a microemulsion intermediate.

MOLECULAR WEIGHT PROPERTIES OF ASPHALTENES CALCULATED FROM GPC DATA FOR OCTYLATED ASPHALTENES

ACEVEDO S; ESCOBAR G; RANAUDO M A; RIZZO A

VENEZUELA CENTRAL UNIV

FUEL V 77, NO 8, PP 853-858, JUNE 1998

Octylated asphaltenes (OA), and hexane-soluble n-octyl derivatives of asphaltenes, have been used for the determination of more realistic molecular weight averages and molecular weight distributions (MWD) of asphaltenes. Here we report the synthesis and characterization of the Hamaca OA. Both C-13 and elemental

analyses show that about five n-octyl groups per 100 carbon atoms are incorporated into Hamaca asphaltenes. When GPC columns are calibrated with monodisperse octylated asphaltene standards (OAS), the Mn value obtained for Hamaca OA was equal to the one measured by VPO. From this information, and from the GPC results and the above calibration, the MW range (50,000-300), Mn (2250) and Mw (6000) values were calculated for the above

ANOMALOUS EFFECTS ON THE ADSORPTION OF ASPHALTENES ON SOLID SURFACES
ACEVEDO S; ESCOBAR G; RANAUDO M A; CASTILLO J; VENEZUELA CENTRAL UNIV
213TH ACS NAT MTG (SAN FRANCISCO, 4/13-17/97) PAP; BOOKS OF ABSTR (ACS) PT 1, ABSTR NO FUEL 049, 1997.

THE PMO (PERTURBATION MOLECULAR ORBITAL) METHOD FOR ANALYSIS OF STRUCTURAL FEATURES OF POLYCYCLIC AROMATIC HYDROCARBONS RELEVANT TO ASPHALTENES
ACEVEDO S; RANAUDO M A; GUTIERREZ L B; ESCOBAR G; VENEZUELA CENTRAL UNIV
FUEL V 75, NO 9, PP 1139-1144, JULY 1996
The structure of petroleum asphaltenes is a matter of considerable importance and has been the objective of many research projects. Evidence from pyrolysis, chemical and physical experiments suggests that large condensed polycyclic aromatic systems are absent in asphaltenes. The purpose of this work was to try to corroborate this theoretically. Use of the simple PMO method allows the first-order estimation of energies of formation (Ef) of polycyclic aromatic hydrocarbons (PAH) as well as their localization (EL) and bislocalization (Eb) energies. These calculations give theoretical support to experimental evidence in the literature which suggests that massive systems (more than 6 condensed aromatic rings) are not likely to be found in significant quantities in petroleum samples. From EL and Ef, it is predicted that ortho- and peri-fused systems such as pyrene are more likely than ortho-fused systems such as chrysene. The PMO method is also used for the estimation of first-order interaction energies responsible for the stabilization of free radicals.

INTERFACIAL PHENOMENA RELATED TO THE ADSORPTION OF ASPHALTENE MICELLES HOSTING LOW MW (WEIGHT-AVERAGE MOLECULAR WEIGHT) CARBOXYLIC ACIDS
ACEVEDO S; ESCOBAR G; RANAUDO M A; GARCIA A
VENEZUELA CENTRAL UNIV
1ST SPE BRAZIL SECT ET AL COLLOID CHEM IN OIL PROD: ASPHALTENES & WAX DEPOSITION INT SYMP (ISCOP 95) (RIO DE JANEIRO, BRAZIL, 11/26-29/95) PROC PP 248-251, 1995 (3 REFS) , 1995
The surface activity of the natural surfactants present in crude oils was studied. The 2 areas of focus were the isolation and characterization of natural surfactants and the isolation of carboxylic acids. The high stability of water in crude oil emulsions is attributed to the adsorption of a multilayer of asphaltenes and resins at the oil-water interface, which provides the interface with specific rheological properties. It is concluded that asphaltenes are cosurfactants adsorbed to improve the packing of the interface, whereas the surfactants are low molecular weight bases and acids, such as the carboxylic acids investigated.

USE OF OCTYLATED ASPHALTENES IN THE DETERMINATION OF THE SIZE, SHAPE AND DISPERSION PROPERTIES OF ASPHALTENES
ESCOBAR G; RANAUDO M A; RIZZO A; ACEVEDO S
VENEZUELA CENTRAL UNIV
1ST SPE BRAZIL SECT ET AL COLLOID CHEM IN OIL PROD: ASPHALTENES & WAX DEPOSITION INT SYMP (ISCOP 95) (RIO DE JANEIRO, BRAZIL, 11/26-29/95) PROC PP 242-247, 1995 (3 REFS) , 1995
Octylated asphaltenes (OAs) had been used for the purpose of calibration of GPC columns. In this way, molecular weights as well as molecular weight distribution could be obtained that are more reliable than those found with a polystyrene calibration. From gel permeation chromatography data, it is shown that asphaltene molecules are very thin disks, suggesting a predominant planar structure. OAs are also effective dispersing agents for asphaltenes.

ADSORPTION OF ASPHALTENES AND RESINS ON ORGANIC AND INORGANIC SUBSTRATES AND THEIR CORRELATION WITH PRECIPITATION PROBLEMS IN PRODUCTION WELL TUBING
ACEVEDO S; RANAUDO M A; ESCOBAR G; GUTIERREZ L; ORTEGA P
VENEZUELA CENTRAL UNIV
FUEL V 74, NO 4, PP 595-598, APRIL 1995
The solute-solid adsorption isotherms (SSA) of asphaltenes and resins were measured using the inorganic fraction (97% SiO2) of the deposit that plugged the tubing of a production well as an inorganic adsorbent. In other experiments, Ceuta asphaltenes and the product (HA) of heating them at 350(deg)C for 11 hr were used as organic adsorbents in heptane, toluene and heptane-toluene at 26(deg)C. Ceuta and Furrial asphaltenes on the inorganic substrate resulted in multilayer formation (L-3 type adsorption) whereas a Cerro Negro sample gave simple Langmuir-type adsorption. A possible correlation between these results and the tendency of the asphaltenes to precipitate from the crude oils is suggested. Saturation, multilayer formation and pore penetration were apparent in the SSA experiments for the system resins-heptane-asphaltenes. SSA results for the system resins-heptane/toluene-HA were consistent with the steric stabilization theory of colloidal dispersions. Adsorption of aggregates or micelles of asphaltenes was apparent in both.

OBSERVATIONS ABOUT THE STRUCTURE AND DISPERSION OF PETROLEUM ASPHALTENES AGGREGATES OBTAINED FROM DIALYSIS FRACTIONATION AND CHARACTERIZATION
ACEVEDO S; ESCOBAR G; RANAUDO M A; PINATE J; AMORIN A; DIAZ M; SILVA P
VENEZUELA CENTRAL UNIV
24TH ANNU FINE PARTICLE SOC MTG (CHICAGO, 8/24-25/93) PAP; ENERGY FUELS V 11, NO 4, PP 774-778, JULY-AUG 1997
A sample of asphaltenes (ACN) precipitated from Cerro Negro crude oil had been divided into 14 fractions using a dialysis procedure employing THF-acetone mixtures as the extracting solvent. Seven extracts (F1 to F7) and the corresponding residues R1 to R7 were obtained as the mixture composition changed from 40 to 100% THF. These materials were characterized by elemental analysis, vapor pressure osmometry, solubility, C-13 NMR, and electron paramagnetic resonance. As the last fractions are approached, the following trends were observed: H/C decreases, aromaticity increases, solubility decreases, and Sd, the spin density, increases. Removal of the first fraction (F1, 15% of ACN, acetone-THF (40%)) afforded a residue (R1) insoluble in toluene, indicating that 85% of ACN is present as colloidal particles (R1) dispersed in this solvent by F1. More than 12% of ACN found in the last residues (R6 and R7) were found to be insoluble in organic solvents, suggesting that these fractions are formed by aggregates of molecules held in place by strong intermolecular forces. In an asphaltene micelle they would be at the core and its solubility in organic solvents is due to dispersion by the other components of the micelle.

STUDY OF ASPHALTENES AGGREGATION PROCESS IN CRUDE OILS USING CONFOCAL MICROSCOPY
CASTILLO J; GONCALVES S; REYES A; HUNG J
VENEZUELA CENTRAL UNIV; INST VENEZUELA INVEST CIEN; *ENERGY FUELS V 18, NO 3, PP 698-703, MAY-JUNE 2004*
Aggregation and growth of asphaltenes in crude oils of different stability were studied using the titration method and confocal microscopy. Confocal images show a new interpretation for the titration curve. Results show that the flocks growing process and flocks characteristics depend on the crude oil nature and can be related with the stability. High-resolution micrographic images demonstrate that titration trace behavior can be correlated with the crude oil stability.

ABSORBANCE AND FLUORESCENCE SPECTROSCOPY ON THE AGGREGATION BEHAVIOR OF ASPHALTENE-TOLUENE SOLUTIONS
GONCALVES S; CASTILLO J; FERNANDEZ A; HUNG J
VENEZUELA CENTRAL UNIV; IVIC
FUEL V 83, NO 13, PP 1823-1828, SEPT 2004
Evidence of crude oil stability and the tendency of asphaltene aggregation in crude oil have been investigated by absorption and fluorescence spectroscopy. Octylated asphaltenes were also used as reference because of their low aggregation tendency. Changes in the absorbance vs. concentrations in toluene solutions show that aggregation starts around 50 mg/l for Furrial asphaltene and approximately at 75 mg/l for Hamaca asphaltenes. Red shift and quenching in the fluorescence peak maximum observed for solutions when asphaltenes concentrations are increased demonstrate that the aggregation process starts at low concentration regime. These experimental results are consistent with the fact that Hamaca asphaltenes have lower tendency to aggregate than asphaltenes from Furrial crude oils. Our results verify that the tendency to form aggregates diminishes in the octylated form.

NONLINEAR OPTICAL EVIDENCES OF AGGREGATION IN ASPHALTENE-TOLUENE SOLUTIONS
CASTILLO J; HUNG J; FERNANDEZ A; MUJICA V
VENEZUELA CENTRAL UNIV; NORTHWESTERN UNIV
FUEL V 80, NO 9, PP 1239-1243, JULY 2001
Evidences of asphaltene aggregation are presented through the application of the Z-scan technique to study the nonlinear optical response of solutions of asphaltenes in toluene. Strong dependence of the two photon absorption coefficients ((beta)) with the input intensity was observed for concentrated solutions, as opposed to the observed behavior at low concentration. The results suggest that a change in ((beta)) occurs as a consequence of aggregation. The results are of importance for the study of dark samples like those relevant for crude oils. (c2001 Elsevier Science Ltd.)

CLASSIFICATION OF THE ASPHALTS AND THEIR SOURCE ROCK FROM THE DEAD SEA BASIN (ISRAEL): THE ASPHALTENE/KEROGEN VANADYL PORPHYRINS
PREMOVIC P I; TONSA I R; LOPEZ L; LOMONACO S; PAVLOVIC M S
NIS UNIV; VENEZUELA CENTRAL UNIV
FUEL V 77, NO 15, PP 1769-1776, DEC 1998
The asphaltenes of the asphalts from the Dead Sea Basin were examined for the occurrence of vanadyl porphyrins. These examinations demonstrate that the asphalts fall into two broad class types: one which exhibits a relatively high vanadyl porphyrins content (> 300 ppm), and the other characterized with no vanadyl porphyrins (< 10 ppm). It is concluded that these asphalts belong to two distinct types and have separate origins. The kerogens isolated from the petroleum-source rock of the Dead Sea Basin were also analyzed. Two genetic types of kerogen appeared to exist: a marine one highly enriched with these pigments and a terrestrial one with no vanadyl porphyrins. For comparison, the asphaltenes of typical asphaltic crude oils from Western Venezuela and kerogen from their La Luna source rock were also examined. Previous detailed geochemical studies indicated that the La Luna kerogen is derived from marine organic matter source. These materials have higher concentrations of vanadyl porphyrins than the Dead Sea asphaltenes and kerogens are enriched with

these compounds. Our results strengthen the potential of vanadyl porphyrins of both petroleum asphaltenes and source-rock kerogen for use in genetic and correlation studies. (c1998 Elsevier Science Ltd.)

CHARACTERIZATION OF PETROLEUM ASPHALTENES BY THERMAL FIELD FLOW FRACTIONATION USING MODIFIED MOBILE PHASES
CEBALLO C D; MARTINEZ R; ESCALONA A
PETROLEOS VENEZUELA SA; VENEZUELA CENTRAL UNIV;*PETROL SCI TECHNOL V 17, NOS 7-8, PP 783-810, AUG-SEPT 1999*
Thermal field flow fractionation (ThFFF) was used to determine the molecular weight average (Mw) and distribution of Venezuelan crude asphaltenes. Thermophoretic mobility (DT) was determined as a measure of transport characteristics. The experiments were performed in tetrahydrofurane and toluene, as well as with the addition of a dispersion agent to these solvents. Polystyrene standards were run under the same conditions for system calibration. Results indicate that differences among asphaltenes from different crudes, or the same asphaltene kept under different conditions, can be qualitatively observed in the fractograms, or quantitatively from ThFFF data (Mw, Mn, Mz, molecular weight distribution and DT), in different solvents. Even though this study was not conducted to elucidate the mechanism of the dispersion agent, it could be found that a second factor, analogous to a secondary chemical equilibrium studied in sedimentation field flow fractionation, can be introduced in ThFFF to expand its applicability to relative small molecules and/or aggregates in complex structures like asphaltenes.

V/NI RATIO IN MALTENE AND ASPHALTENE FRACTIONS OF CRUDE OILS FROM THE WEST VENEZUELAN BASIN: CORRELATION STUDIES
LOPEZ L; LO MONACO S; GALARRAGA F; LIRA A; CRUZ C
VENEZUELA CENTRAL UNIV
CHEM GEOL V 119, NOS 1-4, PP 255-262, 1/5/95
This study presents the contents of S, V and Ni in the maltene fraction (hydrocarbons plus resins) extracted from 15 crude oil samples, belonging to the Mara and Mara Oeste fields of the Maracaibo Basin, Venezuela. Results are discussed according to their implications in oil-oil correlation studies, and are compared with previous work where the same analytical parameters have been used for total oil and for its asphaltene fraction. Results obtained suggest that the V/Ni ratio may be used as a correlation parameter and as a genetic indicator when determined in any of the oil fraction, coupled with the results of the distribution of biomarkers. The absolute concentration of these elements may be used as indicators of alteration processes in the reservoir.
CORROSION

5.2.1.3 Corrosión

CORROSION CONTROL IN THE OIL AND GAS INDUSTRY USING NODAL ANALYSIS AND TWO-PHASE FLOW MODELING TECHNIQUES
PALACIOS C A; CHAUDARY V
CORPOVEN SA; VENEZUELA CENTRAL UNIV
4TH SPE LATIN AMER & CARIBBEAN PETROL ENG CONF (PORT OF SPAIN, TRINIDAD & TOBAGO, 4/23-26/96) PROC V 2, PP 501-511, 1996 SPE-36127 Characterization of corrosion in the oil and gas industry is of importance. This article presents the methodology used to characterize the corrosion behavior of the production facilities, taking into consideration the hydrodynamic and thermodynamic conditions of the produced fluids (flow velocities, flow pattern, liquid holdup, pressure, temperature, etc.) as they flow from the reservoir through the surface installations (flowlines, gas/oil gathering and transmission lines, gas processing plants, artificial lift systems, etc.). The methodology uses Nodal(TM) System Analysis and 2-phase modeling techniques to (1) optimize the entire production system, taking into consideration the corrosive/erosive nature of the produced fluid and (2) characterize the corrosive nature of the produced fluid.

APPLICATION OF SIMULATION TECHNIQUES FOR INTERNAL CORROSION PREDICTION
PALACIOS T C A; HERNANDEZ Y
CORPOVEN SA; VENEZUELA CENTRAL UNIV
NACE INT CORROSION CONF (CORROSION 97) (NEW ORLEANS, 3/9-14/97) PAP NO 2 1997 (17 PP; 19 REFS) , 1997
Characterization of corrosion in the oil and gas industry is becoming of increasing importance, for safety reasons as well as for the preservation of production facilities, to prevent downtime and damage to the environment. This article presents the methodology used to characterize the corrosion behavior of the whole production facility, taking into consideration the hydrodynamic and thermodynamic conditions of the produced fluids (flow velocities, flow pattern, liquid holdup, pressure, temperature, etc.) as they flow from the reservoir through the surface installations. The methodology uses petroleum engineering and 2-phase modeling techniques to (1) optimize the entire production system to obtain the most efficient objective flow rate, taking into consideration the corrosive/erosive nature of the produced fluid; and (2) characterize the corrosive nature of the produced fluid as it flows through the installations. The modeling techniques were performed by using commercially available simulators, and CO2 corrosion rates were determined by using well-known published correlations. For H2S corrosion, NACE MR0175 criteria are applied. This methodology has provided corrosion control strategies, protection and monitoring criteria, and inhibitor optimization and has increased the effectiveness of already existing corrosion control systems.

ISOLATION OF POTENTIAL CORROSION INHIBITING COMPOUNDS IN CRUDE OILS
HERNANDEZ S E; BRUZUAL J; LOPEZ-LINARES F; LUZON J G
PDVSA INTEVEP; VENEZUELA CENTRAL UNIV
NACE INT CORROSION CONF (CORROSION 2003) (SAN DIEGO, CA, 3/16-20/2003) PAP NO 03330 2003 (24 PP; 11 REFS) , 2003
A unique procedure was developed and followed in order to isolate, characterize, and evaluate the adsorption properties of chemical species that are present in Venezuelan crude oils, in order to correlate the chemical structures present in different aqueous extracts with their protective behavior against CO2 corrosion. Differential capacitance is used as a tool to evaluate adsorption properties of crude oil, their extracts, and fractions. The results verified the presence of higher amounts of compounds analogous to corrosion inhibitors in the fractions with higher adsorption properties. The hypothesis of nitrogen-based compounds being responsible for corrosion protection at low concentrations of paraffinic crude oil is verified. Nitrogen-based compounds, such as quinolines, tertiary amines, and anilines, are related to both adsorption and corrosion inhibiting properties of this crude oil at low concentrations.

CO2 CORROSION BEHAVIOR OF CARBON STEEL IN PRESENCE OF SOLIDS DEPOSITED IN COOLERS OF A GAS COMPRESSION PLANT
RAMIREZ M; VILORIA A; CASTILLO M; BALZA A
PDVSA INTEVEP; VENEZUELA CENTRAL UNIV
NACE INT CORROSION CONF (CORROSION 2003) (SAN DIEGO, CA, 3/16-20/2003) PAP NO 03445 2003 (8 PP; 7 REFS) , 2003
Natural gas produced in the northern part of Monagas State in Venezuela has a high content of liquids (water and hydrocarbons) and average concentrations of CO2 and H2S of 7% and 60 ppm, respectively, in addition to some contaminants (e.g., asphaltenes). CO2 corrosion behavior of carbon steel in the presence of deposits found in coolers of a gas compression plant was observed. To carry out this study, weight loss tests were performed using carbon steels filmed with deposits and in the presence of a corrosion inhibitor. Surface analysis was done to determine the kind of damage caused in the presence of these compounds.

(R) CORROSION CONTROL IN THE OIL AND GAS INDUSTRY USING NODAL ANALYSIS AND TWO-PHASE FLOW MODELING TECHNIQUES
PALACIOS C A; CHAUDARY V
CORPOVEN SA; VENEZUELA CENTRAL UNIV
OFFSHORE MULTIPHASE PRODUCTION OPERATIONS: VOLI (SPE REPRINT SER NO 58) PP 227-237, 2004 SPE-36127

5.2.1.4 Gas Natural y GNL

STRATEGIES SIMULATION MODEL FOR THE GAS BUSINESS CHAIN MEGAS
DE GONZALEZ S M; UZCATEGUI R; BREA E; DIAZ R
CORPOVEN SA; VENEZUELA CENTRAL UNIV
73RD ANNU GPA CONV (NEW ORLEANS, 3/7-9/94) PROC PP 213-220, 1994 (9 REFS) , 1994
MEGAS is a simulation model representing fundamental parameters of Corpoven's natural gas and NGL production, handling, processing, transportation and distribution systems in the Venezuelan mid-east, as well as its financial implications. Various strategies regarding development, prices, costs, new business opportunities, production scenarios, demand and energy policies can be evaluated through this model in order to determine, after analyzing the economics results, a set of strategies to follow in the mid- and long-term. MEGAS could also be used to make risk analysis studies, considering that probabilistic parameters and variables like gas quality, production, demand, plant shutdowns and others are to be represented by their distinctive function. It is possible to set up a probabilistic function for each economic indicator or operating variables with an appropriate experiment design. MEGAS is based on a dynamic simulation language, which facilitates both the real system components representation and the main variables statistical data accumulation. It also allows graphical representation of results and simulation animation.

CARBON DIOXIDE REMOVAL FROM NATURAL GAS USING AMINE SURFACE-BONDED ADSORBENTS
LEAL O; BOLIVAR C; OVALLES C; URBINA A; REVETTE J; GARCIA J J
VENEZUELA CENTRAL UNIV; INTEVEP SA
212TH ACS NAT MTG (ORLANDO, FL, 8/25-29/96) PAP; BOOK OF ABSTR (ACS) PT 1, ABSTR NO FUEL 093, 1996.

APPLICATION OF NEURAL NETWORKS IN THE PREDICTION OF RESERVOIR HYDROCARBON MIXTURE COMPOSITION FROM PRODUCTION DATA
BRIONES M F; ROJAS G; MORENO J A
CORPOVEN SA; ORIENTE UNIV; VENEZUELA CENTRAL UNIV
4TH SPE LATIN AMER & CARIBBEAN PETROL ENG CONF (PORT OF SPAIN, TRINIDAD & TOBAGO, 4/23-26/96) PROC V 2, PP 299-309, 1996, SPE-36104
Applications of the artificial neural network technology in the field of petroleum reservoir engineering are presented. An artificial neural network (ANN) is applied to the derivation of nonlinear empirical correlations relating field information from production tests with molar composition obtained from validated PVT analysis. The Radial Basis Function (RBF) neural network architectures are used in the generation of nonlinear

correlations between input and output datasets. In this work, the RBF paradigm implements a prediction system that relates the gas-oil ratio and API gravity with corresponding molar compositions of C1 and CO2 and the pseudocomponent composition C2-C6 and C7+. This work was conducted with selected data from 2 Venezuelan regions with marked differences in fluid properties, the new production areas of the north of Monagas and old production areas.

MATHEMATICAL MODEL TO SIMULATE UNSTEADY FLOW IN GAS PIPELINES WITH CONDENSATION (MODELO MATEMATICO PARA SIMULAR FLUJO NO-PERMANENTE EN GASODUCTORS DONDE OCURRE CONDENSACION)

GARCIA-MARTINEZ R; MATA L J
VENEZUELA CENTRAL UNIV; *REV FAC ING (VENEZUELA CENT UNIV) V 11, NO 1, PP 25-33, 1996*
This work describes a mathematical compositional model to simulate 2-phase flow in gas pipelines with condensation. Algorithms that consider variable physical gas properties as a function of the gas composition are formulated. A model to calculate condensation of gas components is incorporated to the model. Results of various test cases show that the evolution of the holdup is linear in time periods simulated. However, this behavior may not be generalized to high holdup sections since liquid obstruction leads to changes in pressure and mass transfer rates in the gas-liquid interface may show a nonlinear time evolution. The proposed model may be used to simulate slow time varying gas flow and could be a useful tool to study liquid removal methods in gas pipelines.

ANALYSIS AND MODELLING OF TIME SERIES IN SIMULATION MODELS (ANALISIS Y MODELAJE DE SERIES DE TIEMPO EN MODELOS DE SIMULACION)

DIAZ R; BREA E; MARIN S; UZCATEGUI R
VENEZUELA CENTRAL UNIV; CORPOVEN SA
REV FAC ING (VENEZUELA CENT UNIV) V 11, NO 1, PP 19-24, 1996.
One of the most important phases in the development of a simulation model is data collection and analysis. This methodology was applied in the data analysis stage of the strategies simulation model for the gas business chain (MEGAS) that Corpoven S.A. uses in medium- and long-term planning processes. The general difficulty found in having access to statistical data related to variables of interest often leads to the use of other techniques, e.g., expert judgment, in order to solve the problem and thus continue with the other stages in the model development such as validation, experimentation, etc. However, the availability of data does not solve the problem entirely, since more sophisticated data analysis techniques are required, such as smoothing and moving averages for time series analysis and Fast Fourier Transform to perform spectral analysis.

STRATEGIES SIMULATION MODEL FOR THE CORPOVEN GAS BUSINESS CHAIN (MEGAS): CONCEPTUALIZATION (MODELO DE SIMULACION DE ESTRATEGIAS PARA EL NEGOCIO DEL GAS (MEGAS) DE CORPOVEN: CONCEPTUALIZACION)

DIAZ R; BREA E; MARIN S; UZCATEGUI R
VENEZUELA CENTRAL UNIV; CORPOVEN SA
REV FAC ING (VENEZUELA CENT UNIV) V 11, NO 2, PP 43-50, 1996
MEGAS is a simulation model representing fundamental parameters of Corpoven's natural gas and NGL production, handling, processing, transportation, and distribution systems in the Venezuelan mid-east, as well as its financial implications. Various strategies regarding development, prices, cost, new business opportunities, demand, and energy policies can be assessed through this model in order to determine (after analyzing the economics results) a set of strategies to follow in the mid- and long-term. MEGAS could be also used to make risk analysis studies, considering that probabilistic parameters and variables such as gas quality, production, demand, plant shutdowns, and others are to be represented by their distinctive function. It is possible to set up probabilistic functions for each economic indicator or operating variables with an appropriate experimental design. MEGAS is based on a dynamic simulation language, which allows both a representation of the real system components and the accumulation of statistical data of the main variables. MEGAS should be considered as a tool that eases strategic business planning, making it possible for the corporation to foresee changes, predict how these changes could affect its business affairs, and visualize different return scenarios.

OPTIMIZATION OF NGL (NATURAL GAS LIQUIDS) EXTRACTION PLANTS

TRUJILLO J; MARZUKA S; RON-PEDRIQUE A
VENEZUELA CENTRAL UNIV; INELECTRA
REV FAC ING (VENEZUELA CENT UNIV) V 17, NO 1, PP 91-96, 2002 (ISSN 07984065; 7 REFS) , 2002
Venezuela is among the top 10 countries with the largest natural gas reserves, ca 93% of which consist of associated gas (gas and oil). Aimed at optimizing the use of natural gas in Venezuela, this project studies and designs mini-plants for extracting liquids from natural gas, assessing the existing technologies, and using operational advantages that appear when a liquid extraction plant is coupled with a gas compression plant for crude oil secondary recovery. With the potential increase in hydrocarbon production due to opening up the Venezuelan oil industry to private company investment, natural gas generation will increase notably. So far, there is no development for the use of the gas employed in secondary recovery, which may foster opportunities in the recovery and in the subsequent commercialization of NGLs.

STUDY OF THE BEHAVIOR OF THE SANTA BARBARA NGL (NATURAL GAS LIQUID) EXTRACTION PLANT TO ELIMINATE CO2 FROM FEED GAS (ESTUDIO DEL COMPORTAMIENTO DE LA PLANTA DE EXTRACCION DE LGN SANTA BARBARA AL ELIMINAR EL CO2 DEL GAS DE ALIMENTACION)

ZAMBRANO T; DIAZ R; DE HERRERA J T; MARZUKA S; VENEZUELA CENTRAL UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 17, NO 1, PP 97-103, 2002

The high commercial value that NGLs have acquired in the market and the requirements of the Venezuelan petrochemical industry are an incentive for trying to optimize processes associated with the extraction of NGLs. The aim of the Ethane Project at the Eastern Venezuelan Cryogenic Complex is to recover this component of the natural gas stream and to meet the demands of the national petrochemical industry. The plant was designed to operate either for ethane rejection or recovery purposes. Design characteristics of the plant make a 56% recovery of this component possible when it works for recovery purposes, but there is a need to increase this recovery level to at least 70% in order to obtain the ethane volume demanded by the market. The increase of the ethane recovery volume requires the elimination of the CO2 contained in the plant feed, thus avoiding the solidification of this component. A study was conducted on the behavior of this plant when it operates for rejection purposes and when the CO2 of the feed stream has been eliminated. Eliminating the CO2 from the extraction plant feed when operating to reject the ethane results in a 5.6% increase in NGL production and, therefore, in a 0.6% decrease of the residual gas volume. This slight decrease of the residual gas volume is offset by an increase of its calorific power, since it will not contain CO2.

5.2.1.5 *Geofisica*

INVERSION OF TRAVELTIME DATA UNDER A STATISTICAL MODEL FOR SEISMIC VELOCITIES AND LAYER INTERFACES

BOSCH M; BARTON P; SINGH S C; TRINKS I

VENEZUELA CENTRAL UNIV; CAMBRIDGE UNIV; GLOBE INST PHYSIQUE; DURHAM UNIV

GEOPHYSICS V 70, NO 4, PP R33-R43, JULY-AUG 2005

We invert large-aperture seismic reflection and refraction data from a geologically complex area on the northeast Atlantic margin to jointly estimate seismic velocities and depths of major interfaces. Our approach combines this geophysical data information with prior information on seismic compressional velocities and the structural interpretation of seismic sections. We constrain expected seismic velocities in the prior model using information from well logs from a nearby area. The layered structure and prior positions of the interfaces follow information from the seismic section obtained by processing the short offsets. Instead of using a conventional regularization technique to smooth the interface-velocity model, we describe the spatial correlation of interfaces and velocities with a geostatistical model, using a multivariate Gaussian probability density function. We impose a covariance function on the velocity field in each layer and on each interface in the model to control the smoothness of the solution. The inversion is performed by minimizing an objective function with two terms, one term measuring traveltime residuals and the other measuring the fit to the statistical model. We calculate the posterior uncertainties and evaluate the relative influence of data and the prior model on estimated interface depths and seismic velocity.

ADAPTIVE TRAVELTIME TOMOGRAPHY OF DENSELY SAMPLED SEISMIC DATA

TRINKS I; BARTON P J; SINGH S C; CHAPMAN C H; BOSCH M; CHERRETT A

CAMBRIDGE UNIV; GLOBE INST PHYSIQUE; SCHLUMBERGER CAMBRIDGE RES; VENEZUELA CENTRAL UNIV

GEOPHYSICAL JOURNAL INTERNATIONAL V 160, NO 3, PP 925-938, MARCH 2005

A new 2-D traveltime tomography method is presented for the inversion of densely sampled seismic streamer data. This method was especially designed for the efficient inversion of long-offset multichannel data. A layer-interface model is used to fit ray-traced traveltime data to observed seismic data. The solution of the forward problem is based on initial-value ray tracing in a triangulated grid with a linear interpolation of the squared slowness. An adaptive model parametrization based on ray density is presented, which allows for smaller velocity cells with subsequent iteration steps. The inverse problem is solved using an iterative linearized joint inversion of reflection and refraction data for interface and velocity structures. Adaptive smoothing regularization is implemented in the form of a priori model covariances. As the cell sizes decrease with increasing iteration numbers, the model covariance ranges are reduced, allowing for more detail to emerge in the model. The algorithm's ability to successfully invert a realistic crustal velocity structure in a synthetic model is demonstrated. Several adaptive and nonadaptive model parametrizations are tested. The joint interface and velocity inversion of real long-offset reflection and refraction traveltime data is presented as a second example. It is demonstrated that the results are in good agreement with independently derived velocity models.

THE OPTIMIZATION APPROACH TO LITHOLOGICAL TOMOGRAPHY: COMBINING SEISMIC DATA AND PETROPHYSICS FOR POROSITY PREDICTION

BOSCH M; VENEZUELA CENTRAL UNIV

GEOPHYSICS V 69, NO 5, PP 1272-1282, SEPT-OCT 2004

Least-squares model optimization methods are commonly used to estimate physical media properties by fitting geophysical data with nonlinear models. This formulation is extended to joint estimation of physical properties and lithological description of the media. Incorporation of petrophysical information within the inversion scheme provides the coupling between lithology and media physics by describing the geostatistical relation between them. The resulting procedure iteratively adjusts the joint model to simultaneously fit geophysical data, the petrophysical statistical medium description, and prior information on the lithology, following equations derived for the Newton's optimization method. Although more calculations are required to incorporate the additional information and estimate the model update, the algebraic system of linearized equations can be transformed appropriately to remain within the same dimensions of the conventional inverse formulation. In the particular case when the petrophysical transform is linear (i.e., the function of lithological parameters that provides the expected values of the physical parameters), the lithological inversion equations

are equivalent to the corresponding equations of a conventional inversion followed with the inverse petrophysical transform.

ADAPTIVE TRAVELTIME AND RAY-PARAMETER INVERSION OF DENSELY SAMPLED 2-D SEISMIC DATA

TRINKS I; BARTON P; SINGH S; CHAPMAN C; BOSCH M; CHERRETT A
CAMBRIDGE UNIV; GLOBE INST PHYSIQUE; SCHLUMBERGER CAMBRIDGE RES; VENEZUELA CENTRAL UNIV;
66TH EAGE CONF (PARIS, FRANCE, 6/7-10/2004) EXTENDED ABSTR PAP NO P063, 2004
A new 2-D traveltime and ray-parameter tomography algorithm especially designed for the inversion of densely sampled seismic data is presented. Until now, most of the available traveltime inversion schemes have been limited to sparsely sampled data sets with crude regular model parameterizations. The algorithm described in this paper allows for an adaptive parameterization based on Delaunay triangulation. The forward problem is solved using initial-value ray tracing and the traveltimes are calculated analytically. The inverse problem is solved in the form of a linearized joint inversion of velocities and interfaces with a smoothing regularization based on model covariances. An efficient joint traveltime and ray-parameter inversion was implemented.

TRAVEL TIME INVERSION UNDER GEOSTATISTICAL CONSTRAINTS

BOSCH M; BARTON P; SINGH S
VENEZUELA CENTRAL UNIV; CAMBRIDGE UNIV; GLOBE INST PHYSIQUE
73RD ANNU SEG INT MTG (DALLAS, TX, 10/26-31/2003) EXPANDED ABSTR BIOGR V 1, PP 718-721, 2003
A method is described to invert traveltime data under geostatistical constraints on the model structure and compressional velocities. The formulation is based on the minimization of a joint objective function with a geophysical term describing data fit and a prior information term describing the geostatistical model hypotheses. The latter are defined by prior velocities and interface depths, corresponding variances, and spatial covariances. The method is applied to large aperture seismic data from the Northeast Atlantic margins for estimating a velocity and structural model that jointly explains traveltimes of major seismic phases and prior information. For this example, prior information on velocities is derived from the statistical analysis of well log data, and a structural interpretation of processed seismic data is used for defining model layers and prior interface depths.

LITHOLOGY DISCRIMINATION FROM PHYSICAL ROCK PROPERTIES

BOSCH M; ZAMORA M; UTAMA W
VENEZUELA CENTRAL UNIV; GLOBE INST PHYSIQUE
GEOPHYSICS V 67, NO 2, PP 573-581, MARCH-APRIL 2002
The estimation of lithology from multiple geophysical survey methods needs to be addressed to develop advanced tomographic methods. An initial requirement for lithology discrimination is that lithology should be discriminable from the media properties physically related to the geophysical observations. To test this condition for different combinations of the most common crustal rocks, several lithology discrimination exercises were performed on rock samples under laboratory conditions. The physical properties included mass density, compressional velocity, shear velocity, electric conductivity, thermal conductivity, and magnetic susceptibility. A categorical description of the sample lithology was followed; hence the inference consisted of predicting the sample rock category (lithotype) membership. The joint information provided by the physical properties of the rocks discriminates sample lithotype correctly. Successful classification results were obtained for a variety of common lithotypes (granite, gabbro, limestone, tuff, marble, basalt, and gneiss) using three common classification methods: clustering analysis, Gaussian classification, and discriminant analysis. Although discrimination was positive with each of these multivariate classification techniques, discriminant analysis showed some advantages for the classification and graphic analysis of the data.

JOINT INVERSION OF GRAVITY AND MAGNETIC DATA UNDER LITHOLOGIC CONSTRAINTS

BOSCH M; MCGAUGHEY J
VENEZUELA CENTRAL UNIV; MIRA GEOSCIENCE LTD
LEADING EDGE V 20, NO 8, PP 877-881, AUG 2001
Interpreting exploration data requires combining different types of information to solve the geologic puzzle. It implies bringing together all data components into an image that makes conceptual sense in terms of the geology of the exploration area. The identification of geologic objects and the inference of a spatial description of the lithology--consistent with all available information--are the objectives of the process. The object of the present work is to incorporate geophysical inversion methodologies as a tool in geologic interpretation, describing a process to jointly invert gravity and magnetic data that takes into account petrophysical and geologic constraints. Basically, the method seeks lithologic models that explain the overall data, helping with the task of quantitatively reconciling the available geologic and geophysical information. The process uses a geostatistical model to couple the lithology with realistic density and magnetic susceptibilities. Hence, the values of density and magnetic susceptibilities are a priori conditioned by the lithology, avoiding unrealistic excursions allowed by common inversion approaches. However, prior information about the lithology, such as a geologic surface map or an interpreted drill hole, is incorporated in the inversion and satisfied by the resulting models.

LITHOLOGIC TOMOGRAPHY: AN APPLICATION TO GEOPHYSICAL DATA FROM THE CADOMIAN BELT OF NORTHERN BRITTANY, FRANCE

BOSCH M; GUILLEN A; LEDRU P
VENEZUELA CENTRAL UNIV; BUREAU RECH GEOL MIN (FR); *TECTONOPHYSICS V 331, NOS 1-2, PP 197-227, 2/10/2001*

A probabilistic description of subsurface lithologic structures can be established by inverting multidisciplinary geophysical data constrained by geological and geostatistical priors. The methodology is based on the joint modelling of several media properties and on a statistical description of the relationships between them. The information provided by the geophysical data and the geological and geostatistical priors is represented by probability density functions (pdf) that are combined into a posterior pdf composed by: (1) a prior pdf in the space of the primary (lithologic) model parameters, (2) a pdf of the secondary (physical) model parameters conditional to the primary model parameters and (3) a joint likelihood function that is the product of the independent likelihood functions for each observed geophysical field. Applying a Markov chain sampling method enables a large sample of joint models to be generated from the posterior pdf. The true configuration of the media is then determined from the representation of models pulled from the chain and the elaboration of statistics from the large sample of posterior joint models. The method was used to invert gravity and magnetic data jointly characterising the mass density field, the magnetic susceptibility field and the lithotype field along two 2-D sections of the geological units in the Cadomian belt of northern Brittany.

INTEGRATED GEOPHYSICAL INTERPRETATION OF A NW-SE TRANSECT THROUGH THE VENEZUELAN ANDES (INTERPRETACION GEOFISICA INTEGRADA DE UN TRANSECTO NW-SE A TRAVES DE LOS ANDES VENEZOLANOS)
ESCOBAR I A; RODRIGUEZ I
VENEZUELA CENTRAL UNIV
4TH BRAZIL GEOPHYS SOC INT CONGR/1ST LATIN AMER GEOPHYS UNION CONF (RIO DE JANEIRO, BRAZIL, 8/20-24/95) EXPANDED ABSTR V 1, PP 273-276, 1995

GEOPHYSICAL MODELING OF THE SHALE RIDGES IN THE EASTERN VENEZUELAN BASIN
DIAZ G M; ARMENIO A
VENEZUELA CENTRAL UNIV; LAGOVEN
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; AAPG BULL V 80, NO 8, P 1286, AUG 1996

NMR APPLICATIONS FOR THE DETERMINATION OF SEDIMENTARY FACIES AND POROSITY SYSTEMS IN CARBONATIC CORE PLUG SAMPLES
ALFREDO M N; JOSE M B
PDVSA INTEVEP; VENEZUELA CENTRAL UNIV
SPE OFFSHORE EUROPE OIL & GAS CONFERENCE (ABERDEEN, SCOTLAND, 9/6-9/2005) PROCEEDINGS 2005, SPE-95878
The use of NMR techniques to determine petrophysical properties of reservoirs has been described in many previous works. But, together with Gamma Ray logs, thin sections and capillary pressure curves, NMR can contribute further to the characterization of sedimentary environments and porosity systems. In this work the results of the above mentioned techniques are presented. Almost 40 plug samples form a cored well in the Formation of Cretaceous age in Southwest Venezuela have been measured and described according to four sedimentary facies. We have found that the shape of the NMR T2 distributions and thin fine section images of each samples show a pattern related to the sedimentary facies the samples belong to. Another contribution of this work is that, unlike other reservoirs in Venezuela, the shape of the T2 distributions for the sample set can have one, two, three, or four maxima or peaks depending on the porosity's system type e.g. intracrystalline, fractures, synsedimentary fractured and vugs.

Geología

MIXED CARBONATES IN LA VELA FORMATION (LATE MIOCENE- PLIOCENE): WESTERN VENEZUELA (CARBONATOS DE MEZCLA EN LA FORMACION LA VELA (MIOCENO TARDIO-PLIOCENO): VENEZUELA OCCIDENTAL)
ZAPATA E; REY O; PADRON V; MACHADO A
VENEZUELA CENTRAL UNIV, *REV FAC ING (VENEZUELA CENT UNIV) V 16, NO 1, PP 73-84, 2001*
La Vela Formation, in El Trigal creek, Falcon state, is represented by clay-silty deposits with least intercalations of sandy materials, all in a coarsening-up sequence, which closes its top with shelly or calcareous deposits. The sediments and sedimentary rocks studied are mostly lithotypes of carbonate muddy support with a high percentage of siliciclastic materials, quartz, and rock fragments. Texturally, the samples are immature products of varied to fine granulometry, with floating grain contact to point contact. The distinctive bioclastic components belong to FORAMOL association. The studied rocks were petrographically evaluated and classified according to Mount (1985) as sandy micrite (32%), sandy allochem limestone (19%), sparse biomicrite (7%), micritic sandstone (39%), and conglomerates not analyzed in this paper (3%). By the textural and compositional features, they respond to a low energy flow, showing shallow to coastal environments (bay) with continental influence. The organic processes (pellets, borings, etc.) and the physic-chemical (dissolution, heteroaxial inversion, and glauconitization), established in the studied rocks, situate the sequence in early diagenesis.

ANALYSIS OF FORAMINIFERA IN THIN SECTIONS OF LA LUNA FORMATION, SAN MIGUEL RIVER, MERIDA STATE (ANALISIS DE FORAMINIFEROS EN SECCIONES FINAS DE LA FORMACION LA LUNA, RIO SAN MIGUEL, ESTADO MERIDA)
ZAPATA E; PADRON V; MADRID I; MACHADO A
VENEZUELA CENTRAL UNIV, *REV FAC ING (VENEZUELA CENT UNIV) V 16, NO 2, PP 111-115, 2001*
The identification of foraminifera in thin sections of the La Luna Formation in the San Miguel River established a

late Turonian-Campanian age using the faunal chart elaborated by Premoli Silva & Sliter, 1999. The diagenetic overprinting present in the entire sequence made it difficult to recognize the planktic and benthic foraminifers. In the modal count of the microfossils, from the base to the top, a predominance of planktics and a remarkable increase of benthic from the middle part of the section to the top is observed, a consequence of the progressive increase in oxygenation through time of the bottom of the basin. Upsection, the planktics decrease in abundance, and the carinate "specialists" and genus Whiteinella disappear, while the "opportunistics" taxa persist.

ANOXIA VERSUS PRODUCTIVITY AND ITS EFFECTS ON PALEOECOLOGY: A CASE STUDY OF THE LA LUNA FORMATION BLACK SHALES IN THE VENEZUELAN ANDES
KERTZNUS V R; ZAPATA E; PADRON V
CENTRAL VENEZUELA UNIV, *ANNU AAPG-SEPM MTG (SALT LAKE CITY, UT, 5/11-14/2003) PROC P A91, 2003*

The occurrence of organic-rich sediments in western Venezuela involved a complex relationship between the paleobathymetry, paleoecology, and paleoceanography, evidenced on the stratigraphic record by the faunal behavior and sedimentological and geochemical features. The establishment of appropriate conditions for the preservation of organic-rich sediments seemed to be controlled at great scale by eustatic changes and major oceanic circulation, while small scale could be controlled by bottom waters oxygen-level variations originated by local conditions. Four paleoecologic correlation intervals can be established. The first spans from the Cenomanian to early Coniacian, and it represents a highstand-system-tract. The second spans from mid-Coniacian to early-mid-Santonian, and during this period, a transgressive event developed the most anoxic conditions within the basin evolution associated with the OAE3. Hence forth, an important change in the paleoceanographic setting developed unstable and eutrophic conditions in the water column, the fourth interval begins with more oxygenated conditions and a new transgressive-system-tract, leading to the drowning of the platform and closing the deposition of the La Luna Formation. (Original not available from T.U.)

BIOSTRATIGRAPHIC, SEDIMENTOLOGIC, AND CHEMOSTRATIGRAPHIC STUDY OF THE LA LUNA FORMATION (LATE TURONIAN-CAMPANIAN) IN THE SAN MIGUEL AND LAS HERNANDEZ SECTIONS, WESTERN VENEZUELA
ZAPATA E; PADRON V; MADRID I; KERTZNUS V; TRUSKOWSKI I; LORENTE M A
VENEZUELA CENTRAL UNIV; PETROLEOS VENEZUELA SA
PALAIOS V 18, NOS 4-5, PP 367-377, OCT 2003 Depositional paleoenvironmentals of the La Luna Formation were established based on an investigation of sedimentology, foraminiferal assemblages and stable isotope composition of two sections in the Venezuelan Andes. Planktonic foraminiferal biostratigraphy indicates that the age of the San Miguel section spans from the late Turonian to the early Campanian, and the Los Hernandez section ranges from the early Coniacian to the early Campanian. The base of the La Luna Formation becomes progressively younger toward the south. Early-diagenetic processes have altered stable isotopic composition of carbonates; however, stratigraphic changes in carbon isotope values can be used to correlate between the sections. The depositional environment of the La Luna Formation changed during the Late Cretaceous. Interval I, from the early Coniacian to mid-Santonian, was characterized by anoxic conditions. Alternating anoxic-dysoxic environments in Interval II lasted from the mid-Santonian to the base of the Campanian. Interval III, in the early Campanian, was marked by more oxygenated conditions.

SEDIMENTOLOGIC STUDY OF THE MISOA FORMATION IN LA SERRANIA DE TRUJILLO, ZULIA STATE (ESTUDIO SEDIMENTOLOGICO DE LA FORMACION MISOA EN LA SERRANIA DE TRUJILLO, ESTADO ZULIA)
MARQUEZ F; BERTORELLI G; ZAPATA E; FALCSN R; PADRSN V; REY O
MARAVEN SA; VENEZUELA CENTRAL UNIV
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; AAPG BULL V 80, NO 8, PP 1311-1312, AUG 1996

PROCESSES OF FORMATION IN THE MIXED ROCKS OF THE CERRO NEGRO MEMBER, CUBAGUA FORMATION. NUEVA ESPARTA STATE, VENEZUELA
ESTEVEZ J A; ZAPATA E; PADRON V; REY O; MACHADO A, VENEZUELA CENTRAL UNIV
15TH ALICANTE UNIV ET AL INT SEDIMENTOLOGICAL CONGR (ALICANTE, SPAIN, 4/12-17/1998) ABSTR P 319, 1998

ICNOCENOSIS OF THE NEOGENE-QUATERNARY SEDIMENTS IN NORTHEASTERN VENEZUELA
PADRON V; ZAPATA E; ESTEVEZ J A; MACHADO A
VENEZUELA CENTRAL UNIV
15TH ALICANTE UNIV ET AL INT SEDIMENTOLOGICAL CONGR (ALICANTE, SPAIN, 4/12-17/1998) ABSTR PP 595-596, 1998

PETROGRAPHIC-ENVIRONMENTAL ANALYSIS IN MIXED SEDIMENTS OF THE NEOGENE-QUATERNARY OF MARGARITA ISLAND, VENEZUELA
ZAPATA E; MACHADO A; REY O; PADRON V; ESTEVEZ J A
CENTRAL VENEZUELA UNIV
15TH ALICANTE UNIV ET AL INT SEDIMENTOLOGICAL CONGR (ALICANTE, SPAIN, 4/12-17/1998) ABSTR P 837, 1998

MIXED SILICICLASTIC AND CARBONATE CLASSIFICATION IN SEDIMENTS AND ROCKS OF THE CUBAGUA AND TORTUGA FORMATIONS. ARAYA PENINSULA, VENEZUELA
ZAPATA E; PADRON V; REY O; MACHADO A; ESTEVEZ J A
CENTRAL VENEZUELA UNIV
15TH ALICANTE UNIV ET AL INT SEDIMENTOLOGICAL CONGR (ALICANTE, SPAIN, 4/12-17/1998) ABSTR P 838, 1998

CLASSIFICATION OF THE SILICICLASTIC AND CARBONATE MIXTURE IN THE SEDIMENTS AND ROCKS OF THE CUBAGUA AND TORTUGA FORMATIONS, ARAYA, SUCRE STATE (CLASIFICACION DE SILICICLASTOS Y CARBONATOS DE MEZCLA EN SEDIMENTOS Y ROCAS DE LAS FORMACIONES CUBAGUA Y TORTUGA. ARAYA, ESTADO SUCRE)
ZAPATA E; PADRON V; REY O; ESTEVEZ J A
VENEZUELA CENTRAL UNIV, *BOL SOC VENEZOLANA GEOL V 24, NO 1, PP 5-23, 1999 (ISSN 0583774X; 36 REFS; IN SPANISH) , 1999*

The sediments and the sedimentary rocks studied in Cubagua and Tortuga formations, Araya Peninsula, are mainly lithotypes supported by carbonate mud with high percentages (10 to 50%) of siliciclastic grains (fundamentally metamorphic quartz), sand and silt size, texturally immature. The characteristic bioclastic component of these rocks is Foramol association. The diagenetic processes observed in these sequences are carbonate with a very abundant initial micritization, followed by a wide range of cements that culminates with leach processes and smaller acicular cements. Seven petrographic facies were recognized: sandy micrite, sandy allochem limestone, micritic sandstone, muddy micrite, micritic mudrock, sparse biomicrite and packed biomicrite. With the application of Mount's classification (1985), it was possible to define, with precision, the field of the rocks of blended composition, regarding the other types of rocks. The most significative is that the petrographic name, obtained in the laboratory, is perfectly appropriate with the lithotypes observed in the field. It is possible to classify the sediments and rocks by means of a descriptive classification outline of the first order that evaluates as much composition as texture, defining lithologic types that reflect these characteristics.

DISTRIBUTION OF MAJOR AND TRACE ELEMENTS IN LA LUNA FORMATION, SOUTHWESTERN VENEZUELAN BASIN
MONACO S L; LOPEZ L; ROJAS H; GARCIA D; BRICENO H; PREMOVIC P
VENEZUELA CENTRAL UNIV; NIS UNIV
20TH EUROPE ASS ORGANIC GEOCHEM INT MTG (NANCY, FRANCE, 9/10-14/2001) PROC; ORGANIC GEOCHEM V 33, NO 12, PP 1593-1608, 2002
The La Luna Formation (Maraca section), Maracaibo Basin, was studied by means of V and Ni analysis of the bitumen, total organic carbon (TOC), total sulfur (St), major elements (Si, Al, Fe, Mg, Mn, Ca, Ti, Na, K, P), trace elements (V, Ni, Co, Cr, Cu, and Zn), and electron microprobe analysis (EPMA) of the whole rock, and St, major elements (Si, Al, Fe, Mg, Mn, Ca, Ti, Na, K, P), trace elements (V, Ni, Co, Cr, Cu, Zn, Mo, Ba, U, Th) and rare earth elements (La, Ce, Nd, Sn, Eu, Th, Yb, Lu) of the carbonate-free fraction. The results are discussed based on the organic and inorganic association of trace elements and their use as paleoenvironmental indicators of sedimentation. An association between V and organic matter is suggested by means of correlation between V and Ni vs. TOC, the use of EPMA (whole rock) and V and Ni concentrations (carbonate-free fraction), whereas Ni is found in the organic matter and the sulfide phase. Fe is present as massive and framboidal pyrite, whereas Zn precipitates into a separate phase (sphalerite), and Ni, Cu and, in some cases, Zn, can be found as sulfides associated with pyrite. Concentrations of V and Ni (bitumen), TOC, St, V, Ni, Cr, Cu and Zn (whole rock), U, Th, Mo (carbonate-free fraction) are indicative of changes in the dysoxic sedimentation conditions in the chert layers.

BIOSTRATIGRAPHIC ANALYSIS AND ENVIRONMENTAL IMPLICATIONS OF LA LUNA FORMATION, RIO LORO SECTION, WESTERN VENEZUELA
KERTZNUS V R, VENEZUELA CENTRAL UNIV
ANNU AAPG-SEPM CONV (HOUSTON, TX, 3/10-13/2002) PAP ABSTR P A93, 2002
This study is directed to the determination of the age of Rio Loro section based on Premoli Silva & Sliter zonation, as well as to make interpretations of the environmental conditions during the period in which the section was deposited. Those conditions have influence on the morphologic complexity, diversity, and life strategies of the planktonic foraminifers and their assemblages. The biostratigraphic data was correlated to stable isotopes of (delta)13C and (delta)18O curves. The age of the section is geochronologically located between the late Turonian and Campanian. Environmentally, euxinic conditions prevailed from its beginning (late Turonian-Coniacian) being progressively increased until the mid Santonian, where more oxygenated conditions appear and become more evident toward the early Campanian. Although La Luna Formation was deposited in a transgressive period characterized by low oxygenation and oligotrophic stable conditions that allowed the development of stratification in the water column, the overall section shows three periods, characterized by greater oxygenation and representing abrupt changes toward eutrophic conditions that favor the development of opportunist organisms, as well as assemblages dominated by benthonic organisms. (Original not available from T.U.)

DETERMINATION OF ROCK QUALITY IN SANDSTONE CORE PLUG SAMPLES USING NMR (NUCLEAR MAGNETIC RESONANCE)
ROMERO P; BRUZUAL G; SUAREZ O
PDVSA INTEVEP; VENEZUELA CENTRAL UNIV
SOC CORE ANAL INT SYMP (MONTEREY, CA, 9/22-25/2002) PROC PAP NO SCA2002-51, 2002 (6 PP; 5 REFS) , 2002

An approach for rock quality determination is presented using NMR measurements on core plug samples. The NMR response is measured for 42 core plug samples from clastic reservoirs in Eastern Venezuela. The transversal relaxation time distribution (T2) and the capillary pressure curves are obtained for all samples at 100% water saturation of 17.000 ppm salinity and an irreducible water saturation after their drainage in the porous plate apparatus. Petrophysical values such as NMR-porosity, free fluid index (FFI), bound fluid volume (BFV), T2 cutoff and irreducible water saturation Swi from capillary pressure curves are determined. The NMR-permeability is calculated applying the Timur-Coates equation. After analyzing the NMR results of samples of each petrofacies, characteristic patterns were found in their T2 distribution curves. The study reveals that this rock classification can be defined on the basis of the ratio of FFI over BFV, already explicit in the Timur-Coates permeability equation. This approach does not require measurements of capillary pressure curves nor the determination of the main pore throat radius dominating the fluid transport.

HIGH-IMPACT CYCLE-STRATIGRAPHY (HIC): A METHOD APPLIED IN A MIOCENE-PLEISTOCENE SUBSURFACE SECTION, NORTHERN MONAGAS, EASTERN VENEZUELA BASIN

MOSCARDELLI L; LORENTE M A

VENEZUELA CENTRAL UNIV

AAPG INT CONF (BARCELONA, SPAIN, 9/21-24/2003) PROC P A64, 2003

This work documents the application of HIC methods in Northern Monagas, Eastern Venezuela Basin, and its influence on the identification of glacioeustacy processes, climatic changes phenomena, tectonic pulses effects, and the interaction between them in continental to shallow marine molassic paleoenvironments. HIC has been defined as the integration of a wide range of data, including biostratigraphy, sedimentology, well-log, and seismic data. Detailed studies of the biostratigraphic assemblages distribution tied to sedimentology and well log stacking patterns allows the recognition of cycles, using them like a powerful correlation criteria that increases its significance when is coupled with seismic data. The result is a high-impact correlation tool that not only allows the understanding of stratigraphic processes, but also helps to define the basin geometry. Using this criteria, it was possible to identify 400 and 600 ka apparent cyclic periodicity in the 3 studied wells, and it was associated with Milankovith cycles (excentricity) and tectonic effects.

ORBITAL FORCING OF ORGANIC-RICH DEPOSITS FORMATION: RECORD OF THE CONIACIAN-SANTONIAN OAE3 (LA LUNA FORMATION, SAN MIGUEL RIVER SECTION, VENEZUELA)

REY O; LORENTE M A; SIMO T

VENEZUELA CENTRAL UNIV; WISCONSIN UNIV, MADISON, *AAPG INT CONF (BARCELONA, SPAIN, 9/21-24/2003) PROC P A79, 2003*

The Coniacian-Santonian anoxic event (OAE3) is the final of the Cretaceous OAEs. The La Luna Formation (late Cenomanian-late Campanian) of Venezuela represents an excellent source-rock interval; it consists of thin-bedded and laminated, dense, dark gray to black, carbonaceous-bituminous limestone and calcareous shale; and contains numerous chert and phosphorite horizons. The calculated original TOC ranges from 2.5 to 10.8% by wt, and the organic matter is mainly of structureless marine amorphous type with only minor algal fragments and rare vitrine particles. The combined influences of relative sea-level change, OAE2-OAE3 with geographically migrating upwelling, and restricted circulation have been proposed to explain the anoxic condition prevailing during the deposition. Changes in % by wt TOC in the studied section reveal high amplitude cyclic variations, which apparently correspond to orbital forcing. Spectral analysis was used and the wavelength ratios were examined and compared with the ratios of present-day periods of orbital elements. Changes in CaCO3 responded to the eccentricity, obliquity, and precession bands, and the organic carbon reveals cyclicity at the obliquity band. TOC contents suggest periodic climate variations. Fluctuations in detrital clastic input controlled stratification of the water column, oxygen seafloor conditions, and organic carbon preservation.

A RECORD OF LONG- AND SHORT-TERM ENVIRONMENTAL AND CLIMATIC CHANGE DURING OAE3: LA LUNA FORMATION, LATE CRETACEOUS (SANTONIAN-EARLY AMPANIAN), VENEZUELA

REY O; LORENTE M A; SIMO J A

VENEZUELA CENTRAL UNIV; WISCONSIN UNIV, MADISON, *SEDIMENT GEOL V 170, NOS 1-2, PP 85-105, 8/2/2004*

The La Luna Formation was deposited under anoxic/dysoxic conditions in a tropical epicontinental sea on the northwest South America margin. Sedimentological, micropaleontological and geochemical evidence provides insights into factors that influenced the sedimentation and controlled the accumulation of organic-rich deposits at decimeter and meter scales during the youngest of the Cretaceous oceanic anoxic events (OAE). The La Luna Formation consists of an alternation of black marlstones interbedded with black limestones and black marly limestones. The benthic foraminifera assemblages indicate sedimentation in the upper neritic to upper bathyal environment. These rocks contain large amounts of organic matter. It is interpreted that a combination of warm global and rainy climate and the presence of bathymetric barriers caused poor circulation and low rates of water column ventilation during a high sea level in the early Santonian leading to the preservation of carbon-rich deposits in this region. During the late Santonian, a cooling-trend in global climate increased wind strength and upwelling; this change probably reduced runoff causing a weakening of the pycnocline and destabilized the stratification in the water column providing a progressive increase in oxygen in the water column and on the sea floor and a decrease in total organic carbon preservation in a shallower basin.

EQUIVALENCE BETWEEN FORMULAS FOR THE CALCULATION OF ERRORS IN THE AGE PROVIDED BY THE FISSION TRACKS DATING METHOD (EQUIVALENCIA ENTRE LAS DIVERSAS FORMULAS DEL CALCULO DE ERRORES DE LA EDAD DETERMINADA POR EL METODO DE HUELLAS DE FISION)

BERMUDEZ M A; ALSON P; MORA J L

VENEZUELA CENTRAL UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 19, NO 1, PP 119-123, 2004

There are in the literature, diverse formulas for the calculation of the variance of the errors, associated with the determination of the age of a rock using the Fission Tracks Dating Method (FTDM). In order to have a group vision, in this article it is shown how all these formulas are related to only formulae.

BALANCE AND RESTORATION OF REGIONAL SECTION: THRUST BELTS SYSTEMS, EASTERN INNER RANGES IN THE EASTERN VENEZUELAN BASIN
GHINAGLIA P E, VENEZUELA CENTRAL UNIV
101ST ANNUAL GSA CORDILLERAN SECTION/80TH ANNUAL AAPG PACIFIC SECTION MEETING (SAN JOSE, CA, 4/29/2005-5/1/2005) POSTER NO 27-1; GSA ABSTRACTS WITH PROGRAMS V 37, NO 4, P 72, APRIL 2005

PALEOECOLOGICAL AND PALEOENVIRONMENTAL EVOLUTION OF THE NEOGENE URUMACO TROUGH SEDIMENTARY SEQUENCE, FALCON STATE. PALYNOLOGIC AND LITHOLOGIC STUDY (EVOLUCION PALEOECOLOGICA Y PALEOAMBIENTAL DE LA SECUENCIA DEL NEOGENO EN EL SURCO DE URUMACO, ESTADO FALCON. ESTUDIO PALINOLOGICO Y LITOLOGICO)
HAMBALEK N; RULL V; DE DIGIACOMO E; DE GAMERO M L D,MARAVEN SA; VENEZUELA CENTRAL UNIV, *BOL SOC VENEZOLANA GEOL V 19, NOS 1-2, PP 7-19, 1994*
Palynological analysis of the Neogene Urumaco Trough sedimentary sequence allowed dating and paleoecological characterization of several fluvio-deltaic sub-environments, a study only approached previously from micropaleontology. Sedimentation began in the earlier part of the early Miocene with the deposition of Agua Clara Formation. A subsequent regressive event (middle early Miocene) started with the sedimentation of Cerro Pelado Formation and culminated at the end of the early Miocene with the shales of Querales Formation, which indicates transgressive environments. During the middle Miocene, a new deltaic progradation occurred, and Socorro Formation was sedimented. Urumaco Formation was deposited during the late Miocene in a coastal, nearshore environment. The sedimentation of Codore Formation began with its El Jebe Member, under fluvial conditions, being followed by a transgression represented by Chiguaje Member and ending with the continental sediments of Algodones Member. Fluvial conditions were maintained during the deposition of El Vergel Member of San Gregorio Formation (Pliocene). A marine invasion occurred later, during the sedimentation of Cocuiza Member, before the regression represented by the Rio Seco Member (still Pliocene).

CHIGUAJE MEMBER: LA VELA FORMATION OR CODORE FORMATION (MIEMBRO CHIGUAJE: FORMACION LA VELA, O FORMACION CODORE)
REY O; VENEZUELA CENTRAL UNIV, *BOL SOC VENEZOLANA GEOL V 19, NOS 1-2, PP 50-53, 1994 (ISSN 0583774X; 9 REFS; IN SPANISH) , 1994*
For many years the name Chiguaje has been used in the literature of the Falcon Basin to designate the upper member of the La Vela Formation and also the middle member of the Codore Formation. On the occasion of a detailed revision of the field sections of both these formations, it was observed that the Chiguaje Member is in fact a distinctive unit of the Codore Formation, but this is not the case in the La Vela Formation. This paper proposes to restrict the name of Chiguaje as a member of the Codore Formation, discarding at the same time its application to the La Vela Formation.

ORIGIN OF THE PALEOGENE CLASTICS OF THE EASTERN MARACAIBO BASIN IN THE CONTEXT OF CARIBBEAN AND ANDEAN TECTONICS (PROCEDENCIA DE LOS CLASTICOS PALEOGENOS DE LA CUENCA DE MARACAIBO ORIENTAL EN EL CONTEXTO DE LA TECTONICA CARIBE Y ANDINA)
CASTILLO M V; LUGO J; OSTOS M
LAGOVEN SA; VENEZUELA CENTRAL UNIV
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; AAPG BULL V 80, NO 8, P 1279, AUG 1996

THE CHANGING COURSE OF THE ORINOCO RIVER DURING THE NEOGENE: A REVIEW
DE GAMERO M L D, VENEZUELA CENTRAL UNIV
PALAEOGEOGR, PALAEOCLIMATOL, PALAEOECOL V 123, NOS 1-4, PP 385-402, JULY 1996
Recent studies have revealed that the rich fresh-water vertebrate fossil fauna of the Urumaco Formation in NW. Falcon, of late Miocene age, belongs biogeographically to the Orinoco River system. This finding, together with other evidence, can be used to chart the changing course of the Orinoco River during the Neogene and thus date the uplift of various mountain ranges that affected the change in this course. The presence of the Misoa delta in the middle Eocene of the Maracaibo Basin has been suggested as evidence for a large river, running in a south-north direction and draining the Central Cordillera of Colombia and the Guayana Highlands. The late middle Eocene uplifting of W. Venezuela changed the paleogeographic setting, and a new delta-building shifted to the south, represented by the extensive Carbonera Formation of late Eocene to Oligocene age in the Llanos Basin of Colombia and SW. Venezuela. In the earliest Miocene, the Falcon Basin, situated to the east of the Maracaibo Basin, was primarily the site of marine shale sedimentation.

STRATIGRAPHY OF PARAGUANA PENINSULA, VENEZUELA (ESTRATIGRAFIA DE LA PENINSULA DE PARAGUANA, VENEZUELA)
REY O, VENEZUELA CENTRAL UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 11, NO 1, PP 35-45, 1996

The Paraguana Peninsula extends north of the Falcon Basin and represents the northern portion of the Paraguana-Coro High. The oldest sedimentary rocks are early Miocene in age (Cantaure Formation) and represent a regional transgressive event that can be seen in all of N. Falcon. This unit was deposited in shallow marine conditions, which extended from the nearshore zone out to the shallow shelf zone. At the end of the early Miocene, a change in the paleogeography of the Falcon Basin occurred; this event is represented by a decrease in paleobathymetry which indicates a general uplift to the south and west. In Paraguana, this tectonic event is well represented, interpreted as a period of erosion which lasted all of the middle and late Miocene. During early Pliocene, a new sedimentary cycle began, represented by the Paraguana Formation of shallow marine conditions. A second erosive event is observed in the area, disconformably overlying the Paraguana Formation el Alto Conglomerate, which was deposited during Pleistocene time in the nearshore zone. This unit has been highly eroded, which makes it impossible to establish the end of the cycle, but it is related to the deformation of the Falcon Basin.

THE CAUJARAO AND TURUPIA FORMATIONS EAST OF CUMAREBO, NORTHEASTERN FALCON (LAS FORMACIONES CAUJARAO Y TURUPIA AL ESTE DE CUMAREBO, FALCON NORORIENTAL)

DIAZ DE GAMERO M L; GIFFUNI G; CASTRO MORA M

CENTRAL VENEZUELA UNIV; LAGOVEN SA

BOL SOC VENEZOLANA GEOL V 22, NO 1, PP 56-64, 1997

Recent micropaleontological studies have shown that the stratigraphic interval known as Caujarao Formation in the Tocopero area, east of Cumarebo in NE. Falcon, is almost entirely younger than the Caujarao Formation in its type section. The Cumarebo Limestone, a discontinuous development of massive limestones, of late Miocene to early Pliocene age, is the only unit that can be assigned to the Caujarao Formation in the area. The name Turupia Formation is proposed for the interval, consisting predominantly of clays with thin limestone intercalations, overlying either the Cumarebo Limestone or the Agua Salada Formation and underlying the El Veral Formation. The age of the Turupia Formation is late Miocene to early Pliocene, and it was deposited mainly on the upper slope.

PRIMARY MIGRATION WITHIN THE QUERECUAL FORMATION, VENEZUELA: GEOLOGICAL AND GEOCHEMICAL EVIDENCES

LOPEZ L; PASQUALI J

VENEZUELA CENTRAL UNIV

BOL SOC VENEZOLANA GEOL V 22, NO 2, PP 5-16, 1997

The Querecual Formation is an overmature, 700-m-thick stratigraphic section made up of limestones of Cretaceous age. This formation is thought to be the source rock for most crudes of the Eastern Venezuela Basin, including the Orinoco heavy-crude belt. The Querecual Formation has been studied in detail through 36 rock samples taken from its type section (Querecual River, Anzoategui State, Venezuela). The distribution of organic matter was studied in hand specimens, thin sections, and polished sections. Samples were analyzed for total organic carbon, bitumen, bitumen fractions (saturated hydrocarbons, aromatic hydrocarbons, resins and asphaltenes), and n-alkane distribution in the bitumen. Primary migration within the Querecual Formation is thought to occur through macro- and microfractures. It is interpreted that primary bitumen migration in the upper two-thirds of the formation occurred upward and, in the lower third, downward. Bitumen moved as the consequence of the resultant of 2 forces, one derived from flotation or gravity segregation, and the other one derived from overpressure. The observed compositional bitumen's fractionation is thought to be controlled by molecular weight, polarity and structure of its constituents.

GEOSTATISTICAL ANALYSIS OF PETROPHYSICAL VARIABLES INFLUENCING RESERVOIR QUALITY IN THE FRACTURED "O LIMESTONE", MAPORAL FIELD, WESTERN VENEZUELA

FLORES D; GONZALEZ R

PETROLEOS VENEZUELA SA; VENEZUELA CENTRAL UNIV ; *39TH ANNU SPWLA LOGGING SYMP (KEYSTONE, CO, 5/26-29/98) TRANS POSTER NO EEE, 1998*

This study describes the geostatistical analysis applied to both core and log data of the O Limestone to determine the petrophysical variables affecting productivity from this complex, fractured calcareous reservoir in the Maporal field, W. Venezuela. The production history of the wells was also statistically analyzed in order to perform correlations with the interpreted petrophysical variables. Oil production has been found to be facies- and diagenesis-controlled; therefore, due to the fact that core data was scarce, a 2-step approach was developed. First, core analysis data in 3 wells were used to characterize the 4 main flow units of the O Limestone. Then, correlations with log parameters were established in order to extend the classification to wells for which only log data were available.

INTEGRATION OF A SEDIMENTOLOGICAL STUDY AND A MICROCONDUCTIVITY BASED IMAGE LOG WITH EXTRACTED CORES FROM WELL VLE-1254, BLOCK V IN LAKE MARACAIBO, VENEZUELA

CASANOVA B S E; MADRID P I C

PETROLEOS VENEZUELA SA; VENEZUELA CENTRAL UNIV; *ANNU AAPG-DEG-DPA-EMD-SEPM CONV (SAN ANTONIO, 4/11-14/1999) PAP ABSTR P A22, 1999, 1999*

The results of an integration of a sedimentological study and a microconductivity-based image log taken on the well VLE-1254, located on the Block V in Lake Maracaibo, Venezuela, are presented. One thousand ten feet (1,010 ft) of Eocene Lower Misoa Formation core material were analyzed in terms of lithology, sedimentary structures, texture, mineralogy and facies and oil-stained on an inch-by-inch scale. The microconductivity logs were processed to reflect the characteristics observed in the cores. The image log was an extremely useful tool to recognize different lithologies, sedimentary facies, nature of contact between facies, sand-to-shale ratio of

thinly laminated intervals and, in some cases, sedimentary structures. It was, therefore, useful to interpret uncored sequences. The limitations observed include (1) oil-stained was reliably recognized only on coarse-grained sandstone facies, while medium- to fine-grained oil-bearing sandstone facies yielded ambiguous results; (2) fractures can be identified only if they are cemented; (3) calcareous intervals are not reliably interpreted on the images; and (4) crossed stratification can only be identified if steep angles are observed. (Original not available from T.U.)

COMPARATIVE STRATIGRAPHY (BIOEVENTS, PALEOENVIRONMENTS AND PALEOCLIMATOLOGY) OF THREE CRETACEOUS-PALEOCENE BOUNDARY SECTIONS (RIO BRAZOS, USA; EL MIMBRAL, MEXICO AND MERIDA, VENEZUELA)

CAROPRESE C; LORENTE M A

VENEZUELA CENTRAL UNIV

ANNU AAPG-SEPM CONV (NEW ORLEANS, 4/16-19/2000) PAP ABSTR P A23, 2000

This study was designed to compare geographically distant Cretaceous/Tertiary sections from lithology (type/thickness), bioevent synchronicity, as well as paleoclimatic instability, in order to acquire insights on local geological effects of the Cretaceous/Tertiary meteorite impact and study magnitude of variability with which it was registered on the stratigraphic record of tropical and temperate paleoregions. There are differences in lithology, siliciclastic rocks in Rio Brazos and Merida, and carbonate rocks in El Mimbral. All deposited in marine paleoenvironments, but with a striking difference in thickness between the iridium anomaly and the extinction levels, reaching up to 50 m in Merida. A variable stratigraphical position of the iridium anomalies, together with seven 65 m.y.-old craters reported from the Northern Hemisphere, led to the idea of a multiple impact; and, since the NK26 nannoplankton zone occurs above the iridium anomaly (Merida section), impacts should have occurred in the time range of 1 to 105 yr, within the Cretaceous/Tertiary boundary.

P-WAVE ATTENUATION - A PLAUSIBLE SEISMIC ATTRIBUTE TO DETECT OIL AND GAS IN VENEZUELA

MARTIN N; AZAVACHE A; LOPEZ M; DONATI M

PDVSA EXPLOR & PROD; CENTRAL VENEZUELA UNIV; PDVSA INTEVEP

EAGE/SPWLA PARIS CHAPTER (SAID) JOINT CONF (PARIS, FRANCE, 11/6-8/2000) PROC PAP NO B-25, 2000

Two 3D field examples from Venezuela about using P-wave attenuation as a plausible seismic attribute for detecting pay zones are shown. The first example is from a 3D pilot project in Eastern Venezuelan Basin, oriented to improve the image of a deep, Miocene oil-prospective turbiditic sandstone reservoir (pay) using RMS P-wave attenuation. It represents a challenge because of the structural and stratigraphic complexity in this area and poor well control. The result analysis shows that P-wave attenuation is more sensitive to the presence of oil and permeability, through the fluidity-rock quality factor, than P-wave amplitude. Then, RMS attenuation map provides a better interpretative image of this oil-bearing reservoir and helps to locate other potential oil prospects in this area. The second example is from a 3D P-wave acquisition in Barinas Basin (Western Venezuela) where there is oil production from the Escandalosa Formation. The analysis of the relationship among amplitude, attenuation, petrophysical, and production data shows that P-wave attenuation provides a criteria to discriminate between oil and gas in carbonates: high P-wave attenuation values are associated with relative high gas-oil ratios, while low gas-to-oil ratios correspond to low P-wave attenuations. Also, the relationship between RMS attenuation and permeability is more significant than obtained using amplitude.

BIOMARKER 18(ALPHA)(H)-OLEANANE: A GEOCHEMICAL TOOL TO ASSESS VENEZUELAN PETROLEUM SYSTEMS

ALBERDI M; LOPEZ L

PDVSA INTEVEP; VENEZUELA CENTRAL UNIV

J S AMER EARTH SCI V 13, NO 8, PP 751-759, 12/29/2000,

This work describes the origin, applications and limitations of a specific biomarker: 18(alpha)(H)-oleanane, which is a paleoenvironmental, organic matter type and age indicator for the assessment of oil-oil and oil-source rock correlations. Specific cases in which this compound has been detected in oils and source rocks in the two main Venezuelan petroleum basins are presented in this work, along with scenarios for future research.

SEISMOSTRATIGRAPHIC STUDY OF A MIOCENE-PLEISTOCENE SUBSURFACE INTERVAL, NORTHERN MONAGAS, EASTERN VENEZUELA BASIN

MOSCARDELLI J L G; LORENTE M A

VENEZUELA CENTRAL UNIV; PETROLEOS VENEZUELA SA

ANNU AAPG-SEPM CONV (DENVER, CO, 6/3-6/2001) PAP ABSTR P A139, 20011

The study area is located in the northern Monagas fields near the Serrania del Interior foothills of the eastern Venezuela basin. The interval of interest is restricted to a subsurface tertiary section which includes the Morichito, Las Piedras, and Mesa formations. Taking into account the characteristics of these units, two alloformations were defined, the Morichito and Las Piedras-Mesa alloformations. The older, Morichito Alloformation was dated as middle Miocene age, based on the identification of Crassoretitriletes and Grimsdalea palynological zones. The unit is composed by conglomerates and coarse sandstones interbedded with siltstones. Data suggest that this unit was deposited in an alluvial fan environment. A late Miocene to Recent age was assigned to the Las Piedras-Mesa Alloformation, based on identification of the Asteraceae

(Bombacacidites and Fenestrites) palynological zone. The unit is composed by interbedded sandstones, siltstones and thin coals. Two allomembers were defined in this unit, Las Piedras and Mesa. Data show that the Las Piedras Allomember was deposited in shallow water marine environments (barrier islands and lagoons), and the Mesa Allomember was deposited in fluvial environments.

TECTONIC AND PALEOENVIRONMENTAL CHANGES AT THE END OF LA LUNA FORMATION SEA AND ITS EXPLORATION IMPLICATIONS
PARRA M; MOSCARDELLI L; LORENTE M A
VENEZUELA CENTRAL UNIV; PETROLEOS VENEZUELA SA, *ANNU AAPG-SEPM CONV (DENVER, CO, 6/3-6/2001) PAP ABSTR P A151, 2001*
The Tres Esquinas Member is a phosphorite unit glauconite rich associated with the changes that took place in Western Venezuelan Basin at the end of the Late Cretaceous. In the Perija area three different associations characterized by a poor allochemical portion and foraminifer fauna, along with important carbonate matrix development and poor definition of mineral facies were defined: foraminifer and intraclastic wackstone (FIW); glauconitic and dolomitic wackstone (GDW); glauconitic wackstone (GW); and planktonic foraminifer mudstone (PFM). The microfacies analysis reveals reworking and erosion processes as part of Tres Esquinas Member sedimentation dynamic. This elements can be associated to paleoenvironmental and tectonic changes that took place at the end of La Luna Formation deposition. This high energy condition would be related to the geodynamic framework developed in the western boundary of South America plate during Late Cretaceous. The modification of the Cretaceous epicontinental shelf configuration control the erosion and deposition processes creating a new stratigraphic play at the Colon-La Luna formation contact.

ORBITAL CYCLICITY DETECTED IN K-T BOUNDARY, WESTERN VENEZUELA
GONZALES E; PROKOPH A; LORENTE M A
OTTAWA UNIV; VENEZUELA CENTRAL UNIV
36TH ANNU AMER ASS STRATIGR PALYNOLOGISTS MTG (ST CATHARINES, ONTARIO, 10/5-8/2003) ABSTR; PALYNOLOGY V 28, P 245, 2004

5.2.1.6 Geiquímica

GEOLOGICAL AND GEOCHEMICAL INTEGRATED MODEL APPLIED TO THE PALEOCENE COAL MEASURES, TACHIRA SUBBASIN, VENEZUELA
MARTINEZ M; LOPEZ C; GONZALEZ R; PEREZ A; ESCOBAR M
VENEZUELA CENTRAL UNIV
30TH INT GEOL CONGR (BEIJING, CHINA, 8/4-14/1996) ABSTR V 2, P 869, 1996

GEOCHEMICAL EVIDENCES OF TERRESTRIAL OILS FROM ORINOCO OIL BELT, VENEZUELA, BY GAS CHROMATOGRAPHY- MASS SPECTROMETRY AND PYROLYSIS-GC-MS IN WHOLE OIL AND ASPHALTENES
GALARRAGA F; GONZALEZ R; PEREZ A
VENEZUELA CENTRAL UNIV
30TH INT GEOL CONGR (BEIJING, CHINA, 8/4-14/1996) ABSTR V 2, P 892, 1996.

ARE THE BARINAS-APURE CRUDE OILS ALL CRETACEOUS SOURCED?
OLIVARES A C C; ALVAREZ M M; LOPEZ L
PETROLEOS VENEZUELA SA; CENTRAL VENEZUELA UNIV, *ANNU AAPG-SEPM CONV (HOUSTON, TX, 3/10-13/2002) PAP ABSTR P A134, 2002*
It is generally assumed that the Upper Cretaceous-Tertiary source rocks are mostly responsible for the hydrocarbon accumulations in northern South America. What is less appreciated is the contribution of potential Silurian-Devonian-Jurassic source rocks to the overall hydrocarbon reserves. Evidence is evaluated concerning the so-called Venezuelan mixed crude oils and some variations within the classic marine crude oil families. Although work has been done to understand source rocks, oil families and hydrocarbon migration in Venezuela, new data on Barinas-Apure Basin crude oils clearly document an additional oil type (paraffinic-naphthenic versus typical aromatic-naphthenic). The possibility of these crude oils being sourced from older rocks (Pre-Cretaceous beds) is suggested. To test this hypothesis, a rigorous approach to the petroleum system analysis was adopted by taking into account additional parameters in the analytical examination, including the incorporation of age-specific biomarkers and compositional data. An integrated basin modelling study of the interpreted Pre-Cretaceous interval is being carried out and shown here in order to get a better understanding of this proposed petroleum system. (Original not available from T.U.)

ORGANIC GEOCHEMISTRY OF THE FILA MAESTRA COALS, ANZOATEGUI, VENEZUELA (GEOQUIMICA ORGANICA DE LOS CARBONES DE FILA MAESTRA, ESTADO ANZOATEGUI, VENEZUELA)
MORENO O; MARTINEZ M; ESCOBAR M
VENEZUELA CENTRAL UNIV
J S AMER EARTH SCI V 8, NO 2, PP 201-208, APRIL 1995

The vertical and lateral variability of organic geochemical parameters was established for the Seam 4 of the Fila Maestra coal deposit (Quebradon Formation, Oligocene-early Miocene age) through the study of coals and carbonaceous shales collected in different outcrops of the coal seam. The results of the analysis showed little vertical or lateral variation in the properties studied. A gradual increase in ash content in the westward direction, together with a thinning of the coal seam, suggest a greater proximity of the basin border in this direction. High values in pristane/phytane ratio (4-7), predominance of heavy alkanes and high contents in vitrinites clearly indicates that primigenic organic matter was essentially continental in character. However, the bimodal n-alkane distribution, together with a high sulfur (2.7%) and chlorine (0.12%) contents suggest a marine-influenced environment. In consequence, it is proposed that these coals were formed in a transitional environment as salt marshes in coastal lagoons or in low deltaic plains. These results are in agreement with the stratigraphic analysis of the sedimentary unit.

GEOCHEMICAL IMPLICATIONS OF TRACE ELEMENTS AND SULFUR IN THE SATURATE, AROMATIC AND RESIN FRACTIONS OF CRUDE OIL FROM THE MARA AND MARA OESTE FIELDS, VENEZUELA
LOPEZ L; LO MONACO S
CENTRAL VENEZUELA UNIV
FUEL V 83, NO 3, PP 365-374, FEB 2004
Ten trace elements (Cr, Zn, Fe, Mn, Cu, Co, Ni, Mo, V and Sr) and sulfur were determined in the saturate, aromatic and resin fractions of 15 crude oils from Mara (DM) and Mara Oeste (DMO) fields of the Maracaibo Basin, Venezuela. The oils studied are classified as unaltered or altered by biodegradation. In the altered oil, the depletion of n-alkanes, the absence of isoprenoids and the presence of steranes and hopanes unaltered by biodegradation are indicative of moderate biodegradation. The elements Zn, Fe, Mn, Cu, Ni, and Sr were detected in saturated hydrocarbon fraction; Cr and V were detected in the aromatic fraction in addition to the above elements; whereas the elements detected for the resin fraction were Cr, Zn, Fe, Cu, Ni, Mo, V, and Sr. Co was not detected in any fractions of the oils analyzed. Sulfur was found in all fractions of the oils studied. It was proposed that Fe, Zn, Sr, and Mn could have entered the oil during migration or Fe, Zn and Mn as pollutants during oil extraction. Cr and Cu may be of biological origin and Mo could be incorporated into the reservoir through bacteria. Only S, V, and Ni in the resin fractions can be used as indicators of the origin and correlation of Mara and Mara Oeste oils. Based on the results obtained in this work, it can be established that the V/(V + Ni) ratio in the resin fraction can be used as a correlation parameter, for these oils.

GEOCHEMISTRY AND ORGANIC PETROGRAPHY OF TERTIARY COAL CYCLES IN THE MARACAIBO BASIN, WESTERN VENEZUELA
MENDEZ M J; SCHERER W
CENTRAL VENEZUELA UNIV; INTEVEP SA
ANNU AAPG-SEPM-EMD-DPA-DEG CONV (HOUSTON, 3/5-8/95) PAP ABSTR P 65A, 1995
A regional sedimentological and geochemical study of 10 stratigraphic sections measured along the western, southern and eastern rim of the Maracaibo Basin was undertaken in order to discern the regional pattern of coal deposition represented by several delta systems and by the geometry and facies of the cyclothems. More than 250 rock samples from the major cycles were analyzed using pyrolysis, soxhlet extraction, gas chromatography, biomarker mass spectra, as well as vitrinite reflectance, maceral composition and fluorescence spectra. Associated oil seeps and Paleocene produced crude oil samples were also analyzed. Results of this study show that significant amounts of paraffin-rich hydrocarbons could have been generated in the western and southern portions of the basin from Marcelina Formation source rocks. The number and thickness of Paleocene coal measures increases toward the northern end of the west flank for the Maracaibo Basin.

GEOCHEMISTRY OF OIL SEEPS AND ROCK SAMPLES OF THE EARLY TERTIARY SECTION FROM THE NORTHANDEAN FLANK OF THE VENEZUELAN ANDES
TOCCO R; RUGGIERO A; ESCOBAR M; GALARRAGA F
INTEVEP SA; VENEZUELA CENTRAL UNIV
ORGANIC GEOCHEM V 23, NO 4, PP 311-327, APRIL 1995
An organic geochemical study of oil seeps and early to middle Tertiary source rocks of the Northandean Flank of the Venezuelan Andes range was performed to establish the possible contribution of terrestrial source rocks. Source rocks were identified within the Paleocene Barco and Los Cuervos formations, and the late Eocene-Oligocene Carbonera Formation. Biomarker distributions indicate a terrigenous organic source for these units. Geochemical modeling performed by Parnaud et al. (1995), indicated Plio-Pleistocene oil generation for the Orocue Group and middle Miocene to Plio-Pleistocene oil generation for the Carbonera Formation. Geochemical modeling also indicates that the quantity of crude oil expelled by the Carbonera Formation is 4 times that expelled by the Orocue Group (Barco and Los Cuervos formations). A northeast to southwest variation from marine to terrestrial oil seeps was identified based on sterane and terpane distributions. The marine oil seeps appear to be derived from the La Luna source rocks. The characteristics of the mixed oils suggest contributions from different sources (La Luna and a terrestrial source rock) most likely the Orocue Group or Carbonera Formation coals.

PRIMARY MIGRATION WITHIN THE QUERECUAL FORMATION: DISTRIBUTION OF BIOMARKERS
LOPEZ L; SEQUERA Z; GALARRAGA F
VENEZUELA CENTRAL UNIV
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; AAPG BULL V 80, NO 8, P 1309, AUG 1996.

V/NI RATIO IN CRUDE OIL FRACTIONS FROM THE WEST VENEZUELAN BASIN: CORRELATION STUDIES

LO MONACO S; LOPEZ L; ROJAS A; LIRA A
VENEZUELA CENTRAL UNIV
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; A.APG BULL V 80, NO 8, P 1308, AUG 1996.

GEOCHEMICAL STUDY OF THE ORGANIC MATTER FROM QUERECUAL FORMATION, ANZOATEGUI STATE, VENEZUELA
GARBAN G; LOPEZ L; LO MONACO S; LIRA A
VENEZUELA CENTRAL UNIV
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; AAPG BULL V 80, NO 8, P 1292, AUG 1996.

GENETIC CLASSIFICATION OF CRUDE OIL FAMILES IN THE EASTERN VENEZUELAN BASIN
ALBERDI M; LOPEZ E C; GALARRAGA F
INTEVEP SA; VENEZUELA CENTRAL UNIV
BOL SOC VENEZOLANA GEOL V 21, NO 1, PP 7-21, 1996
Four families of crude oils were identified in the Eastern Venezuelan Basin (EVB) by analyzing sulfur composition, absolute V and Ni concentrations and V/Ni ratios in whole oils. Source rock depositional conditions for 2 oil families were inferred using the V/V + Ni vs. S diagram and additional GC and GC-MS data support different source rocks with marine and terrestrial organic matter in EVB. Three oil families were recognized from the Orinoco Oil Belt by calculating the V/Ni ratios of biodegraded oils in which n-paraffins are altered. Differentiation of these families, with marine source rock, may respond to regional changes of organic facies in the Cretaceous source rocks toward the east and the west in the Eastern Venezuelan Basin. Post-accumulation alteration processes introduce important heterogeneities in the saturated hydrocarbon content in crude oils from the Oveja and Ostra fields. Nevertheless, V/Ni ratios are constant for the oils from both fields, indicating a common and unique source rock. The results of this study confirm the reliability of V/Ni ratio parameter for genetic correlation.

GENETIC CLASSIFICATION OF CRUDE OIL FAMILES IN THE EASTERN VENEZUELAN BASIN
ALBERDI M; LOPEZ E C; GALARRAGA F
INTEVEP SA; VENEZUELA CENTRAL UNIV
BOL SOC VENEZOLANA GEOL V 21, NO 1, PP 7-21, 1996
Four families of crude oils were identified in the Eastern Venezuelan Basin (EVB) by analyzing sulfur composition, absolute V and Ni concentrations and V/Ni ratios in whole oils. Source rock depositional conditions for 2 oil families were inferred using the V/V + Ni vs. S diagram and additional GC and GC-MS data support different source rocks with marine and terrestrial organic matter in EVB. Three oil families were recognized from the Orinoco Oil Belt by calculating the V/Ni ratios of biodegraded oils in which n-paraffins are altered. Differentiation of these families, with marine source rock, may respond to regional changes of organic facies in the Cretaceous source rocks toward the east and the west in the Eastern Venezuelan Basin. Post-accumulation alteration processes introduce important heterogeneities in the saturated hydrocarbon content in crude oils from the Oveja and Ostra fields. Nevertheless, V/Ni ratios are constant for the oils from both fields, indicating a common and unique source rock. The results of this study confirm the reliability of V/Ni ratio parameter for genetic correlation.

USE OF MOLECULAR PARAMETERS AND TRACE ELEMENTS IN OIL-OIL CORRELATION STUDIES, BARINAS SUB-BASIN, VENEZUELA
LOPEZ L; LO MONACO S; RICHARDSON M
VENEZUELA CENTRAL UNIV; EXXON PRODUCTION RES CO, *18TH EUROPE ASS ORGANIC GEOCHEM INT MTG (MAASTRICHT, NETH, 9/22-26/97) PROC; ORGANIC GEOCHEM V 29, NOS 1-3, PP 613-629, 1998*
This is a geochemical study of oils from seven fields (La Victoria, Guafita, Caipe, Silvestre, Sinco, Silvan and Palmita) in the Barinas sub-basin, Venezuela. The study focused on the type and quality of the crude oils, their relative correlation, degree of maturation, alteration and the depositional paleoenvironment of the source rock. The crude oils of the Barinas sub-basin can be classified in the range of paraffinic-naphthenic (La Victoria and Guafita) to aromatic naphthenic (Caipe, Silvestre, Sinco, Silvan and Palmita). These crude oils were probably all generated from a similar source rock interval but with lateral variations in lithofacies and redox potential across the Basin. We interpret all of the crude oils to have been sourced from marine, algal and bacterial organic matter with a systematic variation in terrigenous organic content of the source rock. Bulk elemental and biomarker geochemistry indicators suggest that La Victoria and Guafita crude oils were generated from organic matter deposited in a more siliciclastic dominated lithofacies. Crude oils from the Caipe, Silvestre, Sinco, Silvan and Palmita fields seem to have been generated from a more calcareous lithofacies.

ESTIMATION OF VANADYL PORPHYRIN CONCENTRATION IN SEDIMENTARY KEROGENS AND ASPHALTENES
PREMOVIC P I; ALLARD T; NIKOLIC N D; TONSA I R; PAVLOVIC M S;VENEZUELA CENTRAL UNIV; PARIS VI UNIV; NIS UNIV;*FUEL V 79, NO 7, PP 813-819, MAY 2000*
We describe a new, rapid method for determining the concentration of vanadyl porphyrins (VO2+-P) associated with the kerogen of bituminous sedimentary rocks using electron spin resonance (ESR). The method is simple, straighforward and inexpensive. Several concentrations of a vanadyl (VO2+) standard dissolved in glycerol-lignite mixture were prepared. The VO2+ concentrations ranged from 100 to 1000 ppm. The anisotropic ESR spectra of both the standards and kerogen samples were recorded at room temperature and the integrated areas of the pre-selected ESR line (attributed to nuclear spin mI = -5/2) were computed. The concentrations of VO2+ found in the kerogen samples were calculated using the relative ratio of the integrated areas for the standards and the kerogen samples. The VO2+-P concentrations of the kerogen materials were then calculated

using 450 as the mean molecular weight of these species. Quantitative determination of VO2--P in the kerogen fractions in the range of 800-8000 ppm and higher is feasible by the method reported. The method of analysis was also extended to the asphaltene samples (enriched with VO2+-P) and a coal sample containing non-porphyrin VO2+ associated with its organic fraction.

ELECTRON SPIN RESONANCE STUDY OF THE KEROGEN/ASPHALTENE VANADYL PORPHYRINS: AIR OXIDATION

PREMOVIC P I; TONSA I R; DORDEVIC D M; PAJOVIC M T; LOPEZ L; MONACO S L; PAVLOVIC M S
NIS UNIV; MONTENEGRO INST GEOL EXPL; VENEZUELA CENTRAL UNIV, *FUEL V 80, NO 5, PP 635-639*

Thermal behavior of vanadyl porphyrins was studied by electron spin resonance during heating of the kerogens isolated from the La Luna (Venezuela), Maganik (Montenegro) and Serpiano (Switzerland) bituminous rocks at 150 and 250(deg)C for 1 to 20 days in the presence of air. During the thermal treatment of the kerogens the vanadyl porphyrins' resonance signals decrease monotonically and become quite small after six days of heating. Concomitantly, new vanadyl signals appear, and, at longer heating times, dominate the spectrum. It is suggested that the secondary vanadyl species must have been formed from vanadyl porphyrins. Similar conversion of vanadyl porphyrins are observed under the same experimental conditions for the asphaltenes extracted from the La Luna and Serpiano rocks, and the floating asphalt from the Dead Sea (Israel). A comparison of the spin-Hamiltonian parameters for vanadyl porphyrins and vanadyl compounds obtained during pyrolysis of the kerogens/asphaltenes suggests that these are of non-porphyrin type. For comparison, a study was conducted on the Western Kentucky No. 9 coal enriched with vanadium (up to 800 ppm) from six mines. All coal samples show only the presence of predominant vanadyl-non-porphyrin compounds similar to those generated through laboratory heating of the kerogens/asphaltenes in air. In addition, some samples also contain a minor amount of vanadyl porphyrins.

5.2.1.7 Ingeniería de Yacimientos

APPLICATIONS OF ACOUSTIC IMAGE LOGS

RAMONES M; CARMONA R; MARCOS J; QUINN T
MARAVEN SA; VENEZUELA CENTRAL UNIV; WESTERN ATLAS LOGGING SERV
5TH SPE LATIN AMER & CARIBBEAN PETROL ENG CONF (RIO DE JANEIRO, BRAZIL, 8/30/97-9/3/97) PROC 1997, SPE-39013

Acoustic image logs have been acquired in the Barua/Motatan and Mara fields as a part of the information acquistion program implemented by Maraven, S.A. to improve the efficiency of reservoir exploitation. The acoustic image logs have shown great utility in the characterization of reservoirs by providing indispensable geological data along with associated petrophysical and geomechanical reservoir information. The image observed is from the borehole wall which permits description of the reservoir by identification of stratigraphic features, naturally fractured zones, the orientation of fractures, changes in the acoustic reflectivity of rocks (often related to rock density), thin beds, structural analysis, and orientation of local in situ stresses. Additionally, the logs have been used to assist in the control of borehole stability, definition of sedimentary facies, and changes in the porosity of certain facies allowing definition of flow units. Limitations to acoustic image log measurements and applications are discussed. Environmental and drilling effects which may obscure formation features or generate ambiguous information are included.

BENCHMARKING OF STEAMFLOOD FIELD PROJECTS IN LIGHT/MEDIUM CRUDE OILS

PEREZ-PEREZ A; OVALLES C; MANRIQUE E; GAMBOA; M; PDVSA INTEVEP; CENTRAL VENEZUELA UNIV ;*SPE ASIA PACIFIC IMPR OIL RECOVERY CONF (APIORC 2001) (KUALA LUMPUR, MALAYSIA, 10/8-9/2001) PROC 2001, SPE-72137*

A benchmarking study on 43 steamfloods of light/medium crude oils was performed, to find attractive reservoir characteristics and successful operational practices that are used worldwide. More than 30 successful projects were analyzed and summarized in a database, which included reservoir properties, best operational practices, and results obtained. On average, an incremental oil recovery of 19% original oil in place was obtained by steamflooding, during a project lifetime of up to 7 yr. Based on the successful project characteristics, a model to rank potential reservoirs was developed. Reservoir data were analyzed using standard statistical methods. The La Salina reservoir (La Rosa Formation, Lake Maracaibo, Western Venezuela) was selected to apply steamflood technology. Unsuccessful projects from two different reservoirs (the Naval Petroleum Reserve No. 1 and Buena Vista Hills) were analyzed. Reasons for failure included poor reservoir characterization, thief zones, and carbon dioxide formation by decomposition of reservoir minerals.

UPGRADING OF HAMACA CRUDE OIL USING FORMIC ACID AS HYDROGEN PRECURSOR UNDER STEAM INJECTION CONDITIONS

SCOTT C E; BOLIVAR C; DELGADO O; OVALLES C
CENTRAL VENEZUELA UNIV; PDVSA INTEVEP
225TH ACS NAT MTG (NEW ORLEANS, LA, 3/23-27/2003) PAP; BOOK OF ABSTR (ACS) PT 1, ABSTR NO FUEL 26, 2003.

CYCLIC WATER INJECTION SIMULATIONS FOR EVALUATIONS OF ITS POTENTIAL IN LAGOCINCO FIELD

STIRPE M T; GUZMAN J; MANRIQUE E; ALVARADO V
VENEZUELA CENTRAL UNIV; CTR ENERGY TECHNL AMERICAS; PONTIFICIA UNIV CATOLICA
14TH SPE/DOE IMPR OIL RECOVERY SYMP (TULSA, OK, 4/17-21/2004) PROC 2004 SPE-89378.

Cyclic water injection (CWI) has been proposed as a technique to improve water sweep in stratified and fractured reservoirs. This recovery process takes advantage of the pressure transient response in regions of different permeability, leading to forced imbibition of the lesser permeable layers, in the case of stratified reservoirs. A process such as this is expected to yield an additional recovery between 2 and 7% over continuous waterflooding and a reduction in watercut. A full-field model investigates a reservoir of Western Venezuela, the VLE-305, located in the Lagocinco field, to analyze some of the critical variables of the process and determine the potential for cyclic waterflooding. The reservoir is proposed as a candidate for immiscible WAG (water-alternating gas) injection and a successful pilot test has been carried out.

ESTIMATION OF THE PRIMARY OIL RECOVERY EFFICIENCY OF EOCENE AND POSTEOCENE RESERVOIRS PRODUCING BY SOLUTION GAS DRIVE IN THE MARACAIBO BASIN (ESTIMACION DE LA EFICIENCIA DE EXTRACCION PRIMARIA DE PETROLEO EN YACIMIENTOS DEL EOCENO Y POST-EOCENO QUE PRODUCEN POR EXPULSION DEL GAS EN SOLUCION EN LA CUENCA DE MARACAIBO)
CORRIE R D; LINDO O F; MARCIAL P I
VENEZUELA CENTRAL UNIV
REV FAC ING V 9, NO 2, PP 7-16, 1994
The estimation of the percentage or fraction of the volume of oil recoverable technically and economically from the subsurface (reserves) is important information for oil field development planning and programing. A set of equations with correlation coefficients derived from multiple regression analysis is proposed to estimate by volumetric methods the primary oil recovery efficiency from Eocene and Post-Eocene solution gas drive reservoirs located in the Maracaibo Basin, Venezuela. It is based on the physical properties of the rock-fluid system which are easily obtainable in the field or in the laboratory.

(R) EFFECT OF WETTABILITY ON ADVERSE-MOBILITY IMMISCIBLE FLOODS
VIVES M T; CHANG Y C; MOHANTY K K
VENEZUELA CENTRAL UNIV; CELANESE; HOUSTON UNIV, *SPE J V 4, NO 3, PP 260-267, SEPT 1999 (ISSN 1086055X; SPE-57597; REVISED SPE-30760;*

TWO-DIMENSIONAL SOLUTION OF THE BUCKLEY-LEVERETT EQUATION BY HIGH-RESOLUTION METHODS (SOLUCION BIDIMENSIONAL DE LA ECUACION DE BUCKLEY-LEVERETT POR LOS METODOS DE ALTA RESOLUCION)
BERMUDEZ-CELLA M A; GUEVARA-JORDAN J M
VENEZUELA CENTRAL UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 17, NO 2, PP 73-81, 2002
An application of high resolution methods to the solution of the Buckley-Leverett equation in two dimensions is presented. A five-spot geometry is used as a test problem, and a comparison against traditional schemes is analyzed. Results show that high resolution methods are one of the best choices to simulate fluid flow in oil reservoirs.

APPLICATIONS OF SINGULAR VALUE DECOMPOSITION TO DETERMINE STREAMLINE DISTRIBUTION FOR SECTIONALLY HOMOGENEOUS RESERVOIRS
GUEVARA-JORDAN J M; RODRIGUEZ-HERNANDEZ F
VENEZUELA CENTRAL UNIV
SPE OILFIELD CHEM INT SYMP (HOUSTON, TX, 2/13-16/2001) PROC 2001, SPE-65414
This paper presents an original extension of a new numerical method, recently developed by Marathe et al., to determine the streamline distribution in a sectionally homogeneous reservoir with an arbitrary shape and well configurations. It combines the singular valued decomposition algorithm and the classical method of images into an efficient numerical scheme which computes semianalytical solutions for pressure and Darcy's velocity. These solutions are used to obtain the streamline configuration in 2-dimensional reservoirs for single-phase incompressible flow. Very general test problems and numerical examples show that the new method has, in some cases, substantial reduction in CPU times in comparison with the finite and boundary element techniques.

A FUNDAMENTAL SOLUTIONS METHOD AND STREAMLINE APPROACH FOR CONVECTIVE TRACER FLOW IN OIL RESERVOIRS
GUEVARA-JORDAN J M; GONZALEZ-REQUENA R J
VENEZUELA CENTRAL UNIV; *53RD ANNU PETROL SOC CIM TECH MTG (CALGARY, ALBERTA, 6/11-13/2002) PROC 2002 (PAP NO 2002-143)*
A fast approach is presented for solving tracer flow equations in oil reservoirs. It is based on the fundamental solutions method (FSM) for the pressure equation and the exact solution of the concentration equations along the streamlines. The FSM combines a modified version of the image's method (MOI) and the singular value decomposition (SVD) algorithm to obtain linear semianalytical estimates for pressure and velocity in the reservoir. These expressions are used to compute the streamline distribution and the time of flight for each streamline. The tracer concentration is a multidimensional convection equation. It is transformed, by a streamline-time of flight coordinate system, into a linear scalar one-dimensional convection equation along each streamline. These equations are solved sequentially by the method of the characteristic to obtain the tracer concentration in the reservoir.

A FAST METHOD FOR COMPUTING TRACER FLOW IN OIL RESERVOIRS
GUEVARA-JORDAN J M; VENEZUELA CENTRAL UNIV
8TH SPE LATIN AMER & CARIBBEAN PETROL ENG CONF (PORT OF SPAIN, TRINIDAD, 4/27-30/2003) PROC 2003; SPE-81153

A fast numerical scheme for computing tracer flow in oil reservoirs is described. It combines the fundamental solution method (FSM) and the streamline approach (SA) to obtain an efficient algorithm. The FSM is based on the method of images and the singular value decomposition technique to compute the pressure and velocity fields. The SA uses the time of flight along the streamlines to obtain accurate tracer concentration. Applications of the new scheme to a quarter five spot, arbitrary shaped, and multiple wells reservoir problems show that it is faster than boundary and finite element methods.

(R) A NEW MODEL FOR PRESSURE TRANSIENT ANALYSIS IN STRESS SENSITIVE NATURALLY FRACTURED RESERVOIRS

CELIS V; SILVA R; RAMONES M; GUERRA J; DA PRAT G; INTEVEP SA; VENEZUELA CENTRAL UNIV; SCHLUMBERGER;*SPE ADVANCED TECHNOL SER V 2, NO 1, PP 126-135, MARCH 1994, SPE-23668.*

THERMODYNAMIC CHARACTERIZATION OF VOLATILE HYDROCARBON RESERVOIRS BY NEURONAL NETWORKS

BRIONES M F; HIDALGO O; ROJAS G A; MORENO J A
CORPOVEN SA; ORIENTE UNIV; VENEZUELA CENTRAL UNIV; *3RD SPE LATIN AMER & CARIBBEAN PETROL ENG CONF (BUENOS AIRES, ARGENT, 4/26-29/94) PROC V 1, PP 235-243, 1994 SPE-27027*
The technique of artificial neural networks is applied to the thermodynamic characterization of reservoir fluids. The development of a demarcation system that allows the prediction of reservoir fluid type (black oil, volatile oil or gas condensate) based on field information from production tests and validated PVT analysis is described. Neural networks are coarse models of the human neural system and they have been used successfully in solving practical problems of pattern recognition. In this work, a carefully selected dataset of 80 gas-oil ratios API gravity and percentage of C7+ composition values corresponding to black oil, gas condensate, and volatile oil were used for training the neural network. The training objective was the recognition of fluid type. The trained system was validated with 250 PVT laboratory tests from E. Venezuela showing an excellent performance in fluid type characterization.

APPLICATION OF NEURAL NETWORKS IN THE PREDICTION OF RESERVOIR HYDROCARBON MIXTURE COMPOSITION FROM PRODUCTION DATA

BRIONES M F; MARTINEZ E R; ROJAS G A; MORENO J A; CORPOVEN SA; ORIENTE UNIV; VENEZUELA CENTRAL UNIV; *69TH ANNU SPE TECH CONF (NEW ORLEANS, 9/25-28/94) PROC (RESERVOIR ENGINEERING) V 1, PP 359-371, 1994 SPE-28598.*
Applications of the artificial neural network technology in the field of petroleum reservoir engineering are presented. An artificial neural network (ANN) approach is used to derive nonlinear empirical correlations relating field information from production tests (GOR (gas-oil ratio), API (oil density)), with molar composition obtained from validated PVT analysis. Artificial neural networks are computing devices made of many simple highly interconnected processing units which mimic the information processing that takes place in the neural system of animals. The radial basis function neural network architectures are used in the generation of nonlinear correlations between input and output datasets. A prediction system relates GOR and API gravity with corresponding molar composition of C1, CO2, the pseudocomponent composition C2-C6 and C7+.

INTEGRATED STUDY OF UPPER B STRATA, MISOA FORMATION, MOTATN FIELD, DOMO NORTE (ESTUDIO INTEGRADO DEL YACIMIENTO B-SUPERIOR, FORMACION MISOA, CAMPO MOTATN, DOMO NORTE)

BENITEZ R; KABBABE T; ORRIBO J; CHACARTEGUI F; YORIS F
MARAVEN SA; VENEZUELA CENTRAL UNIV
AAPG INT CONF (CARACAS, VENEZUELA, 9/8-11/96) PAP; AAPG BULL V 80, NO 8, P 1274, AUG 1996

GEOMETRICAL DESCRIPTION OF CONTACT LINE FLUCTUATIONS IN HETEROGENEOUS SYSTEMS WITH CONTROLLED WETTABILITY

ARAUJO Y C; ARAUJO M
PDVSA INTEVEP; CENTRAL VENEZUELA UNIV
J COLLOID INTERFACE SCI V 229, NO 1, PP 92-101, 9/1/2000 (ISSN 00219797; 20 REFS) , 2000.

GEL PERFORMANCE SIMULATIONS AND LABORATORY/FIELD STUDIES TO DESIGN WATER CONFORMANCE TREATMENTS IN EASTERN VENEZUELAN HPHT (HIGH-PRESSURE/HIGH-TEMPERATURE) RESERVOIRS

HERBAS J; MORENO R; ROMERO M F; COOMBE D; SERNA A; HERBAS CONSULT ASOCIADOS; VENEZUELA CENTRAL UNIV; COMPUTER MODELLING GRP LTD; *14TH SPE/DOE IMPR OIL RECOVERY SYMP (TULSA, OK, 4/17-21/2004) PROC 2004 SPE-89398*
A gel formulated for HPHT reservoirs was evaluated for conformance treatments to reduce water production and to improve injection profiles in Eastern Venezuelan fields. The gel formulation was based on the permeability ratio reduction capacity obtained from core tests. Field tests were carried out in HPHT wells that exhibited high water cut and low oil rates. These tests showed a strong reduction in the water production and increasing oil rates. A laboratory study under field conditions was conducted to determine the chemical parameters to model the gel injection. The gelation kinetic and visco-elastic effects were determined using dynamic rheology, which shows the time dependence of dynamic mechanical measurements using an elasticity theory. A mechanistic field simulation study was developed with the STARS simulator using laboratory data. A range of variation of critical parameters was evaluated in the simulator in order to understand the gelation process in the reservoir.

RESERVOIRS SIMULATIONS OF GEL TREATMENTS TO CONTROL WATER PRODUCTION, IMPROVE THE SWEEP EFFICIENCY AND THE CONFORMANCE FACTOR IN EASTERN VENEZUELAN HPHT (HIGH PRESSURE/HIGH TEMPERATURE) FRACTURED RESERVOIRS

HERBAS J G; MORENO R; KUMAR S; ROMERO M F; AVENDANO H; HERBAS CONSULT ASOCIADOS; SCHLUMBERGER; VENEZUELA CENTRAL UNIV; RASA

SPE INT PETROL CONF IN MEXICO (PUEBLA, MEXICO, 11/7-9/2004) PROC 2004 SPE-92003

A numerical simulation study was undertaken to model the gel treatments in injector and producer wells in Eastern Venezuela fractured HPHT reservoirs in exploitation under secondary and tertiary recovery process. The objective of the simulation study is to develop a numerical simulation model based on field and laboratory data to model the gel treatments to block induced fractures and high permeable channels in water injection and oil producer wells and to improve the conformance and the recovery factors. Field data representation of a HPHT fractured Venezuelan reservoir with preferential water movement and induced fractures is used to build a conformance field prototype model. The gel used in the simulation study is a polymer system composed of polyacrylamide with phenol and formaldehyde crosslinkers suitable to stand HPHT reservoirs conditions. Available laboratory work and field data to characterize the performance of polymer gels in fractured wells are included in the model.

RESERVOIR SIMULATION OF NONSELECTIVE PLACEMENT OF A POLYMER GEL TREATMENT TO IMPROVE WATER INJECTION PROFILES AND SWEEP EFFICIENCY IN THE LAGOMAR FIELD WESTERN VENEZUELA

HERBAS J G; MORENO R; MARIN A; ROMERO M F; COOMBE D A; HERBAS CONSULT ASOCIADOS; WATER MGMT TECHNOL GROUP; VENEZUELA CENTRAL UNIV; COMPUTER MODELING GRP INC

SPE INT PETROL CONF IN MEXICO (PUEBLA, MEXICO, 11/7-9/2004) PROC 2004, SPE-92025

A reservoir numerical simulation study was done to model a polymer gel treatment pilot test without mechanical isolation, which was performed to improve injection profiles and sweep efficiency in a water injector well in the Lagomar field in Maracaibo Lake, Venezuela. The gel treatment pilot test was performed in the C-4 reservoir, a layered heterogeneous Eocene sandstone. In this reservoir, water injection for secondary recovery has been performed for over three decades. A reservoir characterization analysis that induced PLT (production logging tool) logs, core analyses, and geomechanics identified the presence of induced fractures as a cause of low sweep efficiency. Based on this reservoir study, a polymer gel treatment was designed for an injection well located in the center of a hexagonal well pattern. A commercial gel polymer technology (MARCIT(sm)) was selected to modify the injection profile.

5.2.1.8 Perforación, Producción y Cementación.

THE USE OF DRILLING SOLID WASTE AS AMENDMENT OF ACID-SULPHATE SOILS OF THE ORINOCO DELTA

VASQUEZ P; URICH J; GONZALEZ V; SILVA P; RODRIGUEZ A; INTEVEP SA; LAGOVEN SA; VENEZUELA CENTRAL UNIV

3RD SPE ET AL HEALTH, SAFETY & ENVIRON INT CONF (NEW ORLEANS, 6/9-12/96) PROC V 2, PP 35-44, 1996 SPE-35880

The Venezuelan oil industry has begun an exploration and drilling program in the Orinoco Delta, and a research project is executed to determine the feasibility of landspreading as an option to dispose water-based drilling wastes (DW) to avoid the contamination of water bodies. The original fluvial marine seasonal floodplain nearby Boca de Uracoa was modified after the closure of Manamo distributary, which led to the transformation of the original substrate with high pyrite content, to acid-sulfate soils. Greenhouse experiments were carried out applying DW equivalent doses of 0, 200, 500, 1,000 and 1,500 cu m/ha to an acid-sulfate soil, using as a test plant Zea mays var. PB-8. The results show that the elevated pH of DW (pH of 9.7) neutralizes the acidic reaction of the acid-sulfate soils (pH 2.85) which is reflected in the higher production of biomass. Concentrations of Ba, Pb, and Zn show low leaching and low availability for vegetation.

NEW METHODOLOGY FOR MODELING HORIZONTAL WELLS IN PETROLEUM RESERVOIRS USING GENERALIZED FUNCTIONS (NUEVA METODOLOGIA PARA MODELAR POZOS HORIZONTALES EN YACIMIENTOS PETROLIFEROS MEDIANTE FUNCIONES GENERALIZADAS)

GONZALEZ R J; FERMIN A K; GUEVARA J M

VENEZUELA CENTRAL UNIV

REV FAC ING (VENEZUELA CENT UNIV) V 16, NO 1, PP 39-53, 2001

A new methodology for assessing the transient behavior of pressure generated by horizontal or tortuous wells in a petroleum reservoir is presented. Wells are explicitly represented in the diffusivity equation by a generalized function. For validation purposes, this mathematical implicit model for measuring pressure is solved both analytically and numerically. While the analytical solution does match the Babu and Odeh (1989, 1994) proposal for horizontal wells, it is obtained by different mathematical methods. A new technique is submitted for the numerical solution that combines the Green's function approach and removes singularities methods with traditional finite elements or differences schemes. This new computational approach yields square convergence in coarse grids for 2D cases and very satisfactory results on 3D cases. The major contributions from this numerical method are its independence from the types of grid used in connection with the well's geometric shape, flexibility to model horizontal well trajectories of arbitrary geometry, and its applicability to arbitrary shaped reservoirs, as shown in the studied cases.

A NEW APPROACH FOR MODELING HORIZONTAL WELL SINGULARITIES IN PETROLEUM ENGINEERING
GUEVARA-JORDAN J M; FERMIN A K; GONZALEZ R J
VENEZUELA CENTRAL UNIV
15TH SPE RESERVOIR SIMULATION SYMP (HOUSTON, 2/14-17/1999) PROC PP 335-339, 1999 SPE-51924
A method is proposed to evaluate the transient pressure distribution of horizontal wells with any curvilinear trajectory in isotropic/anisotropic reservoirs of arbitrary shape. This is based on the mathematical representation of the tortuous horizontal well bore using a generalized function. A method for removing the singularities involved in the generalized function allows the reduction of the original problem to the standard solution of the homogeneous diffusivity equation with reformed initial condition and boundary values. This new approach combines the Green function method and any standard numerical technique in a single computational strategy to obtain the transient pressure response generated by a curved/twisted horizontal well in oil reservoirs with irregular frontiers.

APPLICATION OF GENETIC ALGORITHM ON THE DISTRIBUTION OF GAS LIFT INJECTION
MARTINEZ E R; MORENO W J; MORENO J A; MAGGIOLO R; CORPOVEN SA; VENEZUELA CENTRAL UNIV; ZULIA UNIV
3RD SPE LATIN AMER & CARIBBEAN PETROL ENG CONF (BUENOS AIRES, ARGENT, 4/26-29/94) PROC V 2, PP 811-818, 1994 SPE-26993
The application of a genetic algorithm to the problem of optimizing production in oil fields operating under the gas lift method is described. The computational methodology proves to be effective and efficient. The method provides assistance to the production engineer in the problem of assigning optimum gas-injection rates to each individual well given an available total gas supply for the field. This development is incorporated as an important utility in a system for computer-aided analysis and optimization of gas lift wells. The gas-lift optimization system is implemented by means of a genetic algorithm that executes an intelligent search in a gas-injection rate space. A distribution is obtained of gas-injection rates for the wells in the field. This gas-injection rate is compatible with a restriction of the available gas supply for the field, and maximizes the total quantity of produced liquid.

(R) APPLICATION OF GENETIC ALGORITHM ON THE DISTRIBUTION OF GAS-LIFT INJECTION
MARTINEZ E R; MORENO W J; MORENO J A; MAGGIOLO R; CORPOVEN SA; VENEZUELA CENTRAL UNIV; ZULIA UNIV; *69TH ANNU SPE TECH CONF (NEW ORLEANS, 9/25-28/94) PROC (PRODUCTION OPERATIONS AND ENGINEERING) V 2, PP 11-18, 1994, SPE-26993.*

EXPERIMENTAL STUDY OF FLUID/ROCK INTERACTION CAUSED BY DRILLING AND CEMENTING FILTRATES IN CARITO FIELD
GAMBINO F E; GUIMERANS R; PESTANA D C; ROJAS E; GALARRAGA F A
PDVSA INTEVEP; VENEZUELA CENTRAL UNIV
SPE OILFIELD CHEM INT SYMP (HOUSTON, TX, 2/13-16/2001) PROC 2001 SPE-65004
Fluid-rock interactions were evaluated using formation rocks and fluids from Carito field at East of Venezuela, in order to establish better criteria for the design of more efficient cement spacers. Rock and formation fluids were analyzed before and after exposure to overbalanced drilling and cementing filtrates through formation cores. Rock changes were evaluated by X-ray diffraction, SEM, permeability and wettability, whereas fluids were analyzed by fluid and gas chromatography (GC), GC-mass spectroscopy (MS), NMR, and infrared spectroscopy (IR). Results indicate that 100% oil-based mud filtrate produces a large permeability reduction. Spacer A showed greater mud removal efficiency than spacer B, whereas the cement slurry filtrate generates lighter formation permeability reduction than the oil-based mud, after either spacer exposure. This can be explained due to insoluble salts' precipitation when the cement filtrate is in contact to the residual formation water. The molecular analysis of crude samples indicates that the absence of heavy molecules from hopane compounds in the crude saturated fraction could be related to adsorption of these compounds on the rock surface, which is partially oil wettable.

OTRAS AREAS

5.2.1.9 Otras áreas

FREE ENERGY BALANCE FOR THREE FLUID PHASES IN A CAPILLARY OF ARBITRARILY SHAPED CROSS-SECTION: CAPILLARY ENTRY PRESSURES AND LAYERS OF THE INTERMEDIATE-WETTING PHASE
VAN DIJKE M I J; SORBIE K S; LAGO M; ARAUJO M
HERIOT WATT UNIV; MIAMI UNIV, FLORIDA; VENEZUELA CENTRAL UNIV
J COLLOID INTERFACE SCI V 277, NO 1, PP 184-201, 9/1/2004
In this work we derive rigorously the free energy balance for three fluid phases in a straight capillary of arbitrarily shaped cross-section. This balance is then used to derive the general equation for the capillary entry pressures of all possible two-phase and three-phase displacements. Moreover, the equation provides the criterion determining the existence of layers of the intermediate-wetting phase separating the wetting and non-wetting phases in the corners or cavities of a capillary, by also treating the spreading of such layers as a capillary displacement. For a number of combinations of interfacial tensions and contact angles, illustrating all the different relevant situations, we calculate the criteria for spreading of such a layer in the corner of a capillary with polygonal cross-section. In a capillary with a cross-section in the shape of an isosceles triangle of

varying corner size, these criteria are used to determine the unique capillary entry pressures for piston-like displacement from alternative solutions of the general equation. These solutions relate to displacements in the presence or absence of layers in the various differently sized corners.

THE EFFECT OF PH ON KAOLINITE DISSOLUTION RATES AND ON ACTIVATION ENERGY
GANOR J; LASAGA A C; MOGOLLON J L
YALE UNIV; VENEZUELA CENTRAL UNIV
GEOCHIM COSMOCHIM ACTA V 59, NO 6, PP 1037-4052, MARCH 1995
Experiments measuring kaolinite dissolution rates were performed using a stirred-flow reactor at temperatures of 20(deg), 50(deg), and 80(deg)C and in the pH range 2 to 4.2. All experiments were conducted under far-from-equilibrium conditions and with minimum potential catalysts or inhibitors present in the solution. Therefore, the changes in the dissolution rates should be dominantly a function of the pH and the temperature. At 25(deg) and 50(deg)C the dissolution rate is independent of pH in the pH range 2 to 3, while at 80(deg)C the dissolution rate is proportional to (H+)a0.4(+-)0.2. The same proportionality of the rate to (H+)a0.4(+-)0.14 was found at 25(deg) and 50 in the pH range of 3 to 4. In contrast to the results of previous studies, between pH 3 and 4 there is little or no difference between the pH reaction orders at 25(deg) to 50(deg)C. The similarity of reaction orders at different temperatures suggest that there is no pH effect on the activation energy of the kaolinite dissolution reaction. Using all the pH and temperature data, the activation energy obtained is 7.0 (+-) 1.1 kcal/mol.

LIQUID-VAPOR ISOTHERM IN A CLOSED SINGLE-COMPONENT SYSTEM WITH CURVED INTERFACES
LAGO M; ARAUJO M; MARTIN R
PDVSA INTEVEP SA; CENTRAL VENEZUELA UNIV
J COLLOID INTERFACE SCI V 267, NO 2, PP 429-444, 11/15/2003
A thermodynamic model to obtain the radius of bubbles or droplets in a single-component system for a given temperature, total volume, and phase distribution is developed. The general formulation of the model includes bubbles or droplets in the form of spheres, truncated spheres on a flat solid surface or inside conical walls. In these geometries the liquid-vapor curvature radius is positive but in the case of conical walls it can be also negative. States with different dispersed-phase distributions are compared using the total free energy of the system. When the curvature radius is positive, it has a minimum nonvanishing value and the occurrence of the Ostwald ripening is energetically favorable. On the other hand, when the curvature radius is negative, it is energetically more favorable to find the dispersed phase even in the expected single-phase region, and the occurrence of an anti-ripening phenomenon. The PV isotherms obtained from the model and the applicability of the results to the nucleation process are discussed.

LIQUID-VAPOR ISOTHERM IN A CLOSED SINGLE-COMPONENT SYSTEM WITH DROPLETS OR BUBBLES IN SMOOTH CREVICES
LAGO M; MARTIN R; ARAUJO M
PDVSA INTEVEP SA; CENTRAL VENEZUELA UNIV
J COLLOID INTERFACE SCI V 267, NO 2, PP 445-455, 11/15/2003, 2003
A thermodynamic model in order to study a single-component system where droplets or bubbles are inside smooth crevices is presented. Liquid-vapor interface curvature radius can change its sign as the droplets or bubble volume change. The results suggest that there is always dispersed phase inside smooth crevices of microscopic dimensions, even in the expected single-phase region. Thus, the occurrence of an anti-ripening phenomenon is predicted from a microscopic point of view; meanwhile the occurrence of a ripening phenomenon is energetically favorable at a macroscopic scale. The relevance of these results on the heterogeneous nucleation process is analyzed.

ROCK SURFACE MODIFICATIONS BY ADSORPTION OF POLYACRYLAMIDES WITH OR WITHOUT HYDROPHOBIC MONOMERS
CORDOVA M; NAVAS M; MOGOLLON J L
VENEZUELA CENTRAL UNIV; PDVSA INTEVEP
PROGRESS IN MINING AND OILFIELD CHEMISTRY: VOL5: ADVANCES IN INCREMENTAL PETROLEUM PRODUCTION PP 173-182, AKADEMIAI KIADO RT, 2003
Scanning electron microscopy (SEM) studies were conducted to visualize changes in appearance and roughness in mineral surface and to observe affinity for minerals in Berea sandstone after static adsorption experiments. The hydrophobic modified polyacrylamide shows higher affinity for quartz, feldspars, and clays than homopolyacrylamide covering the minerals surface with a layer that masks their morphology. The hydrophobic modified polyacrylamide adsorption reduces surface roughness and may eventually facilitate hydrocarbon flow by a lubrication effect.

ESTIMATION OF MARGINAL DEVELOPMENT CAPITAL COST TO MAINTAIN CONSTANT LEVELS OF PRODUCTION RATES IN THE ORINOCO BELT
CORRIE M R D; CENTRAL VENEZUELA UNIV
REV FAC ING (VENEZUELA CENT UNIV) V 14, NO 2, PP 49-52, 1999 (ISSN 07984065; 3 REFS) , 1999
Two equations are presented. The first one is used to estimate the present value marginal development capital cost to maintain constant levels of production rates of bitumen and heavy oil in the Orinoco Belt. The second equation is used to estimate the total yearly investment required to maintain fixed levels of production rates. The first equation is a linear function, dependent on the capital cost required to generate one unit volume of production per day, the production decline rate, and the interest rate, but is independent of the levels of

production rates. The second equation is a linear function of the capital cost required to generate one unit of production per day, the production decline rate, and a desired level of fixed production rate.

5.2.1.10 Flujo multifasico

EXPERIMENTAL STUDY ON THE STRATIFIED-SLUG TRANSITION FOR GAS-VISCOUS LIQUIDS FLOW IN HORIZONTAL PIPELINES
RIVERO M; OCANDO D; LAYA A
INTEVEP SA; VENEZUELA CENTRAL UNIV
7TH BHR GROUP LTD ET AL MULTIPHASE PROD INT CONF (CANNES, FRANCE, 6/7-9/95) PROC (BHR GROUP CONF SER PUBLICATION NO 14) PP 293-304, 1995 (ISBN 0-85298-974-1; 12 REFS) , 1995
An experimental study is presented on the stratified-nonstratified flow transition of air and viscous liquids having viscosities in the range of 0.001 to 0.202 Pa.s. The study was performed in a horizontal 2-in. diameter pipe, 90-m long test facility. The experimental results were compared with the interfacial instability analysis for viscous and inviscid flows presented by Barnea & Taitel and with the Taitel & Dukler model proposed in 1976. The results agreed with the viscous criterion, if a new interfacial friction factor fi is used. The experimental Fi, calculated from the experimental data, is recommended for further application in the range of viscosities studied. The liquid height and the minimum holdup for the transition were found to be lower than the value 0.5 generally used. The effect of a good prediction of the flow pattern in the pressure drop calculation is shown.

POWER LAW AND COMPOSITE POWER LAW FRICTION FACTOR CORRELATIONS FOR LAMINAR AND TURBULENT GAS-LIQUID FLOW IN HORIZONTAL PIPELINES
GARCIA F; GARCIA R; PADRINO J C; MATA C; TRALLERO J L; JOSEPH D D
VENEZUELA CENTRAL UNIV; PDVSA INTEVEP; MINN UNIV, MINNEAPOLIS
INT J MULTIPHASE FLOW V 29, NO 10, PP 1605-1624, OCT 2003
Data from 2435 gas-liquid flow experiments in horizontal pipelines, taken from different sources, including new data for heavy oil are compiled and processed for power law and composite power law friction factor correlations. To our knowledge this is the largest database so far published in the literature; it includes the widest range of operational conditions and fluid properties for two-phase friction factor correlations. Separate power laws for laminar and turbulent flows are obtained for all flows in the database and also for flows sorted by flow pattern. Composite analytical expressions for the friction factor covering both laminar and turbulent flows are obtained by fitting the transition region between laminar and turbulent flow with logistic dose curves. Logistic dose curves lead to rational fractions of power laws which reduce to the power laws for laminar flow when the Reynolds number is low and to turbulent flow when the Reynolds number is large.

5.2.2 Refinacion

5.2.2.1 Catálisis

PEROVSKITES AS CATALYSTS PRECURSORS: SYNTHESIS AND CHARACTERIZATION, Goldwasser M.R.; Rivas M.E.; Pietri E.; Perez-Zurita M.J.; Cubeiro M.L.; Grivobal-Constant A.; Leclercq G.
Ctro. de Catal., Petrol. Petroquim., Facultad de Ciencias, Universidad Central de Venezuela; Univ. des Sci. ET Technol. de Lille, Lab. de Catal. Heterogene Homogene, *Journal of Molecular Catalysis A: Chemical 228/1-2 SPEC. ISS. 325-331 (**20050316**)*
Perovskites type oxides La(sub)1(sub)-(sub)xCa(sub)xRu(sub)1(sub)-(sub)xNi(sub)xO (sub)3 were synthesized by the citrate sol-gel method. The influence of Ru partial substitution by Ni in the LaRuO(sub)3 structure and of La by Ca on LaRu(sub)0(sub).(sub)8Ni(sub)0(sub).(sub)2O(sub)3 was also investigated in the dry and combine reforming of CH(sub)4. Preparation of the precursor perovskites by the sol-gel method produced solids with high homogeneity and crystallinity that showed a well-defined perovskite structure. During reaction, formation of small and faceted metallic particles with dispersions between 60 and 70% was observed, together with the existence of a significant amount of a La(sub)2O(sub)2CO(sub)3 phase, especially on the LaRu(sub)0(sub).(sub)8Ni(sub)0(sub).(sub)2O(sub)3. Reduction before reaction of the precursor perovskites produced small metallic particles that avoid coke formation and give rise to active and stable catalysts. All perovskites oxides, except LaRu(sub)0(sub).(sub)4Ni(sub)0(sub).(sub)6O(sub)3 were highly active toward the synthesis gas production during the CO(sub)2 reforming of CH(sub)4. 2 tables and graph..

PEROVSKITES AS CATALYSTS PRECURSORS: CO(SUB)2 REFORMING OF CH(SUB)4 ON LN(SUB)1(SUB)-(SUB)XCA(SUB)XRU(SUB)0(SUB).(SUB)8NI(SUB)0(SUB).(SUB)2 O(SUB)3 (LN = LA, SM, ND)
Goldwasser M.R.; Rivas M.E.; Pietri E.; Perez-Zurita M.J.; Cubeiro M.L.; Gingembre L.; Leclercq L.; Leclercq G., Centro de Catalisis, Petroleo y Petroquimica, Universidad Central de Venezuela; Univ. des Sci. ET Technol. de

Lille, Lab. Catalys. Heterogene ET Homogene, *Applied Catalysis A: General 255/1 45-57 (ISSN 0926--860X) (20031128),*

A series of perovskite-like oxide in which the A-site cation of the precursor perovskite, LaRu(sub)0(sub).(sub)8Ni(sub)0(sub).(sub)2O(sub)3, was partially or totally substituted by Ca, Sm, Nd, were used to produce in situ nanoparticles of Ru(Ni) well dispersed on a stable support for the CO(sub)2 reforming of methane. Perovskites of the type Ln(sub)xCa(sub)1(sub)-(sub)xRu(sub)0(sub).(sub)8Ni(sub)0(sub).(sub)2 O(sub)3 (Ln = La(sup)3(sup)+, Sm(sup)3(sup)+, Nd(sup)3(sup)+) were synthesized as catalysts precursors. The reduced solids of nominal composition (Ru,Ni)/CaO and/or La(sub)2O(sub)3, Sm(sub)2O(sub)3, Nd(sub)2O(sub)3, were used as catalysts. The substitution of La by cations of smaller ionic radii (Ca, Nd, Sm) decreased the stability of the perovskites and lowered their reduction temperature. Among the calcium series, La(sub)0(sub).(sub)8Ca(sub)0(sub).(sub)2Ru(sub)0(sub).(sub)8Ni(sub)0(sub).(sub)2(sub) O(sub)3 and La(sub)0(sub).(sub)5Ca(sub)0(sub).(sub)5Ru(sub)0(sub).(sub)8Ni(sub)0(sub).(sub)2(sub) O(sub)3, proved to be the most active catalysts with the highest selectivity to CO. Reduction before reaction of the precursor perovskites produced small Ru-Ni nanoparticles that avoid coke formation and gave rise to active and stable catalysts. Spectra, 5 tables, and 5 graphs

ACETONE TRANSFORMATION OVER PTSN/H(AL)ZSM5 CATALYSTS
Morales R.; Rodriguez E.; Melo L.; Brito J.; Albornoz L.; Llanos A.; Moronta D.
Departamento de Quimica, USB; Facultad de Ingenieria, Univ. Central de Venezuela (UCV); Centro de Quimica, IVIC; Departamento de Quimica, IUT Region Capital; Facultad de Ciencias, UCV
Journal of Molecular Catalysis A: Chemical 203/1-2 277-286 (ISSN 1381--1169) (20030901)

The reaction of acetone transformation over bifunctional monometallic (Pt/H(Al)ZSM5, Sn/H(Al)ZSM5) and bimetallic (PtSn/H(Al)ZSM5) catalysts with variation of their tin atomic fraction (X(sub)S(sub)n) was studied. Acetone transformation was performed at 160.degree.C under 1 atm, at an acetone/hydrogen molar ratio of 3:1, and varying weight hourly space velocity. The results showed a sensitive variation in the catalytic properties as X(sub)S(sub)n was varied in the series of PtSn/H(Al)ZSM5 catalysts prepared. These changes were due to the presence of effects of the electronic and geometric type, which would be a consequence of the formation of a Pt-Sn alloy and probably of the phenomenon of decoration of Pt particles. The product in the reaction of acetone transformation was methyl isobutyl ketone, which was preferentially formed over the PtSn/H(Al)ZSM5 catalysts, with X(sub)S(sub)n .similar to. 0.50.

REDUCTION OF NITROBENZENE TO ANILINE BY CO/H2O CATALYZED BY CIS-(RH(CO)2(AMINE)2)PF6 IMMOBILIZED ON POLY(4-VINYLPYRIDINE)
Mediavilla M; Fernandez M; Pardey A J; Baricelli P; Longo C; Sartori R; Moya S A
Facultad Ciencias Escuela Qumica Univ Central de Venezuela Caracas Venez
Bol. Soc. Chil. Quim. 43(3) 359-362 (1998) Chemical Abstracts (ISSN 0009-2258) ABSTR. NO. 317900 V129 N.24

PREPARATION OF 4-METHYL-2-PENTANONE U SING PT-H(A)ZSM5-TYPE CATALYSTS
Melo L; Llanos A; Garcia L; Yanez F; Giannetto G
Fac Ingenieria Univ Central Venezuela Caracas Venez 1041-A , *Rev. Fac. Ing., Univ. Cent. Venez., 12(1-2) 21-25 (1997) Chemical Abstracts (ISSN 0009-2258) ABSTR. NO. 116551 V128 N.10 (1998).*

PREPARATION OF ACID OR BIFUNCTIONAL CATALYSTS BY DIRECT CALCINATION OF ZEOLITES SYNTHESIZED IN THE ABSENCE OF INORGANIC CATIONS
Giannetto G; Papa J; Monque R; Galiasso R; Gabelica Z, Facultad de Ingenieria Univ Central de Venezuela Caracas Venez 1041A, *Rev. Fac. Ing., Univ. Cent. Venez., 9(1) 13-17 (1994) Chemical Abstracts (ISSN 0009-2258) ABSTR. NO. 333581 V125 N.26*

A STUDY OF THE NI-SB INTERACTION IN A RARE-EARTH Y-ZEOLITE,
Goldwasser, M.R.; Rojas, D.; Goldwasser, J. (Univ. Central de Venezuela, Caracas (Venezuela))
Journal of Catalysis (United States) Scope: 135:2 , Jun 1992 , Page: 596-608
Two series of catalysts were prepared by impregnating nickel and nickel-antimony over a rare-earth exchanged Y-zeolite. The nickel loadings for the monometallic catalysts were within 0.00-1.00% in weight; for the bimetallic systems the Ni loadings were in the 0.10-0.99% range while the Sb loadings were within 0.042-0.84% in weight. The effect of Sb addition on the structure and chemisorptive properties of Ni was examined using reduction studies, CO and H[sub 2] chemisorption, IR spectroscopy, and cracking of isooctane. Complete reduction to metallic nickel and metallic antimony was found for Ni- and Sb-rich catalysts. The addition of Sb dramatically decreased the chemisorption of H[sub 2] and CO. Infrared results suggest the formation of a single species, probably a Ni(CO)[sub x] species, for high-loading (> 0.3%) nickel catalysts (even after desorption of the gaseous CO at room temperature). For the Ni-Sb catalysts the bands were much weaker (in the presence of gaseous CO) and practically disappeared after the evacuation procedure. The cracking of isooctane showed a considerable increase in the formation of coke and hydrogen with increasing Ni loadings. The presence of antimony restored the amounts of coke and hydrogen to the original values present in the unsupported zeolite. Site blockage of Ni by Sb and weakening of the Ni-C bond by the addition of Sb are suggested to explain the results.

5.2.2.2 Combustibles

UPGRADING OF DIESEL FUELS AND MIXTURES OF HYDROCARBONS BY MEANS OF OXYGEN LOW PRESSURE PLASMAS: A COMPARATIVE STUDY
Pedro Patino; Aurora Mejia; Patricia Rodriguez; Bernardo Mendez [Universidad Central de Venezuela, Caracas (Venezuela). Escuela de Quimica, Facultad de Ciencias], *Source: Fuel ; VOL. 82 ; ISSUE: 13 ; ppatino[at]strix.ciens.ucv.ve; PBD: Sep 2003 , September 1, 2003, OSTI Number(s): DE20371482 Contract Number (Non-DOE): FUELAC; TRN 000900248*
The oxidation of n-heptane, 1-octene, toluene, cis-decahydronaphthalene, mixtures of them, 4-phenyl-1-butene, 1,2,3,4-tetrahydronaphthalene, and three commercial diesel fuels, all in the liquid phase, by means of low pressure high-voltage oxygen plasmas was studied. Oxygen pressure was 0.2 mbar, applied power was 35 watts and reaction times ranged from 1 min to 23 h. Both individually and forming part of mixtures, olefins were the most reactive with ground-state atomic oxygen, O([sup 3]P). Olefinic double bonds reacted ca. 150 times faster than C H bonds. Products were: epoxides and aldehydes for olefins; alcohols and ketones for alkanes; phenols for aromatics. Addition of 4.7 7.8% wt of oxygen was achieved for the diesels, depending on the particular composition, those with higher content of olefins being favoured, followed by those with higher content of alkanes. 25 refs., 3 figs., 4 tabs

Asfaltenos

5.2.2.3 Asfaltenos

AGGREGATION OF ASPHALTENES IN A VENEZUELAN CRUDE OIL BY USING CONFOCAL MICROSCOPY
Hung J.; Castillo J.A.; Goncalves Abreu S.; Fernandez A.
Esc. Quim., Fac. Cienc., Univ. Central de Venezuela
Proc. SPIE-Int. Soc. Opt. Eng. 4829/PART 2 651-653 (2004) Chemical Abstracts 141/7-8, (ISSN 0009-2258) ABSTR. NO. 108563 (2004).

EVIDENCE OF MOLECULAR AGGREGATION OF ASPHALTENES BY USING LASER INDUCED FLUORESCENCE TECHNIQUE
Goncalves Abreu S.; Castillo J.A.; Fernandez A.; Acevedo S.
Fac. Cienc., Esc. Quim., Lab. Espectroscopia Laser, Univ. Central de Venezuela
Proc. SPIE-Int. Soc. Opt. Eng. 4829/PART 2 829-830 (2004) Chemical Abstracts 141/7-8, (ISSN 0009-2258) ABSTR. NO. 108562 (2004).

SPECTROSCOPIC STUDIES OF ASPHALTENES
Goncalves Abreu S.; Hung J.; Gutierrez H.; Fernandez A.; Castillo J.A.
Facultad de Ciencias, Escuela de Quimica, Univ. Central de Venezuela
Proc. SPIE-Int. Soc. Opt. Eng. 393-400 (1999) Chemical Abstracts 132/11- 12, (ISSN 0009-2258) ABSTR. NO. 132(12):154141C (2000)

NONLINEAR OPTICAL EFFECT IN ASPHALTENE SOLUTIONS
Castillo J.A.; Hung J.; Fernandez A.; Mujica V.
Escuela de Quimica, Fac. Cienc., Univ. Central de Venezuela
Proc. SPIE-Int. Soc. Opt. Eng. 148-154 (1999) Chemical Abstracts 132/7- 8, (ISSN 0009-2258) ABSTR. NO. 132(8):95487V (2000)

5.2.3 Otros

EVALUATON OF THE EFFICIENCY OF THE AMINE INHIBITOR SX-363 IN CORROSION OF AN AISI 1020 STEEL CAUSED BY THE PRESENCE OF H2S AND CO2 (EVALUACION DE LA EFICIENCIA DEL INHIBIDOR AMINICO SX-363 EN LA CORROSION DE UN ACERO AISI 1020 CAUSADA POR LA PRESENCIA DE H2 S Y CO2)
Staia M H, Venezuela Central Univ
Rev. Fac. Ing. 1(2) (ISSN 0798-4065) (Dec. 1986) 129-134P Petroleum Abstracts (ISSN 0031-6423) ABSTR. NO. 648,266 V37 N.20 (5/17/97)
Evaluaton of the Efficiency of the Amine Inhibitor SX-363 in Corrosion of an AISI 1020 Steel Caused by the Presence of H(sub)2S and CO(sub)2 (Evaluacion de la Eficiencia del Inhibidor Aminico SX-363 En La Corrosion de un Acero AISI 1020 Causada Por La Presencia de H(sub)2 S Y CO(sub)2). Hydrogen release has become a key focus of engineers and scientists due to its major role in iron alloy corrosion in an aqueous medium in the presence of H(sub)2S. Hydrogen is adsorbed on the steel surface in atomic form and, entering the structure, degrades its mechanical properties, e.g., aging, pitting, fatigue and stress corrosion. The metal failure in this acidic medium is due not only to simple dissolution but also to the hydrogen. Inhibitors help to prevent hydrogen adsorption. An electrochemical method is used to measure hydrogen diffusion through and AISI 1020 plate to determine the efficiency of a NALCO inhibitor in aqueous solution in the presence of H(sub)2S.

Energías Renovables

5.2.3.1 Energías renovables

THE USE OF NUCLEAR AND RELATED TECHNIQUES FOR EVALUATING THE AGRONOMIC EFFECTIVENESS OF PHOSPHATE FERTILIZERS, IN PARTICULAR ROCK PHOSPHATE, IN VENEZUELA: I. PHOSPHORUS UPTAKE, UTILIZATION AND AGRONOMIC EFFECTIVENESS

Casanova, E.; Salas, A.M. [Universidad Central de Venezuela, Maracay (Venezuela)]; Toro, M. [Universidad Central de Venezuela, Caracas (Venezuela)] *International Atomic Energy Agency, Vienna (Austria) Source: 8 refs, 6 figs, 3 tabs; Data in PDF format; PBD: Mar 2002 ; In: Assessment of soil phosphorus status and management of phosphatic fertilizers to optimise crop production, 230 pages. Published: March 1,* ***2002***
Report Number: IAEA-TECDOC--1272/CD
OSTI Number(s): DE20357910
Contract Number (Non-DOE): Project VEN-7507; TRN XA0300822041678100
Field experiments were conducted to evaluate the efficiency of natural and modified rock phosphate using conventional and isotopic techniques in an acid soil from El Pao, Cojedes state, Venezuela, using maize and sorghum with the application of different phosphate fertilizers to measure dry matter production, P accumulated in plant, efficiency parameters using isotopic techniques or yield. Finally, commercial plots were established with the application of soluble P fertilizers and rock phosphate products to validate the results obtained in the field experiments. The results showed highly significant differences between partially acidulated rock phosphate, natural rock phosphate, and the check plot in dry matter production, and P accumulation in plant and grain yield. When the efficiency parameters were evaluated in microplots with[sup 32]P-TSP at 60 days of plant growth, it confirmed results obtained in semi commercial plots where the P in the plant derived from the fertilizer was 46% with partially acidulated rock phosphate (PAR) and 14% with natural Riecito rock phosphate (RR). Utilization coefficients of P by the plants were 34.2 and 8.8% for both treatments, respectively. The Substitution relation parameter showed that just 0.8 kg of P of PAR or 3.1 kg P of RR was required to produce the same yield as 1 kg P of TSP. These results were further validated in 5 ha commercial plots using corn and sorghum.

ENERGY, ENVIRONMENT AND TECHNOLOGICAL INNOVATION: ROME 2ND INTERNATIONAL CONGRESS

Rome Univ. (Italy)| Universidad Central de Venezuela, Caracas (Venezuela)
Conference: 2. international congress on energy, environment and technological innovation , Rome (Italy), 12-16 Oct 1992 Publisher: Rome (Italy) , Tipografica La Piramide, Published: 1992, ([10] pages) Report Number: CONF-921013--
Note: 3 v.
From the three volumes containing the proceedings of the October 12-16, 1992 2nd International Congress on Energy, Environment and Technological Innovation held at the University of Rome 'La Sapienza', separate abstracts were prepared for 41 papers. The selection of papers included recent developments and research trends in the following high-tech areas: biomass plantations, wind turbines, photovoltaic power plants, solar architecture, building energy management, global warming, automobile air pollution abatement, district heating with cogeneration, and hydrogen fuels for transportation.

UTILIZATION OF TROPICAL CROP RESIDUES AND AGROINDUSTRIAL BY-PRODUCTS IN ANIMAL NUTRITION. CONSTRAINTS AND PERSPECTIVES

Preston, T.R.; Parra, R. (Instituto de Produccion Animal, Facultad de Agronomia, Universidad Central de Venezuela, Maracay)
Nuclear techniques for assessing and improving ruminant feeds. Proceedings of a combined consultants meeting on nuclear techniques for assessing and improving ruminant feeds and of the first research co-ordination meeting on non-protein nitrogen and agro-industrial by-products utilization by ruminants with particular reference to developing countries organized by the Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development and held in Vienna from 30 November to 4 December 1981
Proceedings series Conference: Meeting on nuclear techniques for assessing and improving ruminant feeds , Vienna, Austria , 30 Nov 1981
Publisher: IAEA,Vienna, Austria
Published: ***1983*** *, Page: 157-177*
Report Number: CONF-8111202- Note: 32 refs.

The importance of by-products and crop residues as animal feeds is increasing steadily. This is a consequence of the increasing demand for cereal grains as both human and animal (chiefly poultry) food, and the increasing demand for energy coupled with decreasing availability of fossil fuels. The effects of these two trends are that primary use of land for livestock production (usually grazing systems) will steadily diminish; at the same time, sources of biomass will increase in importance as renewable energy sources, and greater emphasis will be placed on draught animal power. Most by-products and crop residues are fibrous and therefore of only low to moderate nutritive value, or have special physical and chemical characteristics making them difficult to incorporate in conventional ''balanced'' rations. Such feed raw materials may need special processing and/or

special forms of supplementation if they are to be used efficiently. It is hypothesized that industrial by-products and crop residues will be more efficiently utilized if they are incorporated in diversified and integrated production systems, i.e. (a) livestock production is integrated with production of cash crops both for food and fuel; (b) different livestock species are utilized in the same enterprise in a complementary way; (c) livestock feeding is based on crop residues (energy) supplemented with protein-rich forages and aquatic plants; and (d) animal wastes are recycled and used for food, fertilizer and fuel. This strategy is particularly suitable for the conditions in (i) tropical countries, whose climate favours high crop/biomass yields per unit area and ease of fermentation of organic wastes, and (ii) family farms, for which diversification means greater opportunity for self-sufficiency and increased possibilities for use of family resources.