

## Unidad de Inteligencia Tecnológica Competitiva

### Programa de Aceleración del Conocimiento

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## Presentación

Con esta tercera edición del *Boletín Inteligencia Tecnológica* iniciamos el segundo año de vida de esta publicación, que tiene como objetivo publicar los resultados y experiencias que se obtienen en el mundo científico y empresarial que día a día aportan a los procesos de innovación. Además, constituye una vía de divulgación e intercambio de información entre empresas, centros de investigación, sociedades técnicas e instituciones gubernamentales y está enfocado en temas de interés para el desarrollo de infraestructura en México.

Es producto del trabajo de los participantes en el segundo *Programa de Aceleración del Conocimiento en Inteligencia Tecnológica* de la ahora **Unidad de Inteligencia Tecnológica Competitiva** de la Alianza FiiDEM, A. C., y se enfoca en: Materiales para la elaboración de concreto aislante térmico, Secuestro de CO<sub>2</sub> mediante algas para la producción de biocombustibles, y Alternativas Tecnológicas sobre Aseguramiento de Flujo para Petróleo Crudo Pesado y Extrapesado.

Presenta una recopilación de artículos y patentes que fueron publicados o desarrollados entre los meses de octubre y noviembre de 2011, así como los eventos a realizarse en los próximos meses en torno a dichos temas.

Para nosotros es muy importante contar con su retroalimentación de manera que podamos seguir integrando un producto a la medida de sus necesidades.

*Unidad de Inteligencia Tecnológica Competitiva  
Alianza FiiDEM, AC*

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## RESUMEN EJECUTIVO

### Materiales para la elaboración de concreto aislante térmico

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- ▶ Diseñan herramienta para calcular el ciclo de vida de una construcción y detectar las medidas más importantes para la reducción de emisiones de CO<sub>2</sub> hasta en un 50%. . . . . 5
- ▶ Análisis y evaluación del uso de energía en un edificio con materiales de construcción tradicionales contra materiales de aislamiento innovadores. . . . . 5
- ▶ Ventajas y desventajas de los materiales con aislamiento térmico, así como las diferentes soluciones dependiendo de las especificaciones y circunstancias . . . . . 5
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- ▶ Estudio de diversos materiales para mejorar el aislamiento térmico que puede proveer la ceniza volante dentro del concreto . . . . . 6
- ▶ Estudios en Kuwait calculan el valor  $U$  relacionando las condiciones térmicas, en muros y techos, según cambian la orientación y energía solar recibida. . . . . 6

#### Patentes

- ▶ Concreto celular aireado de sulfato de calcio, aluminio, un aditivo a base de sílice, entre otros componentes. Este concreto poroso da una conductividad térmica de aproximadamente 0.089 W/mK y al menos una resistencia a la compresión de 1.6 N/mm<sup>2</sup>. . . . . 12
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## RESUMEN EJECUTIVO

### Secuestro de CO<sub>2</sub> mediante algas para la producción de biocombustibles

#### Artículos

- ▶ Experiencia sobre los parámetros que se tomaron en cuenta para decidir la ubicación de la planta de captura y almacenamiento del CO<sub>2</sub>. . . . . 6
- ▶ Presentación de datos experimentales sobre elementos fraccionados existentes en la salmuera y el CO<sub>2</sub>, adaptando las condiciones a las existentes en los acuíferos salinos para el almacenamiento de CO<sub>2</sub>. . . . . 7
- ▶ Se valida un modelo basado en el análisis de incertidumbre comparándolo con un sistema de simulación de inyección de CO<sub>2</sub>. . . . . 7
- ▶ A través de un modelo lineal predictivo se identifican los parámetros más importantes que afectan la capacidad de almacenamiento de CO<sub>2</sub>. . . . . 7

#### Patentes

- ▶ Los procedimientos y aparatos para recuperar CO<sub>2</sub>, con una pureza de aproximadamente 80%, a través de un proceso de adsorción. El CO<sub>2</sub> recuperado puede ser utilizado en el proceso de recuperación mejorada del petróleo (EOR).. . . . . 12
- ▶ Un método y un sistema capaz de eliminar el dióxido de carbono directamente del aire ambiente para obtener CO<sub>2</sub> puro.. . . . 13
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## RESUMEN EJECUTIVO

### Alternativas tecnológicas sobre aseguramiento de flujo para petróleo crudo pesado y extrapesado

#### Artículos

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- ▶ Metodología basada en la inyección de aire en el depósito y posterior calentamiento. Para el encendido se usa un aditivo para emulsionar y reducir la viscosidad del aceite . . . 8
- ▶ El objetivo es sintetizar compuestos alquilo de cadena larga y multianillo heteroaromáticos, abundantes en aceites crudos de petróleo, aceites pesados, aceites desasfaltados, asfaltenos y bitumen, responsables de la formación de coque y otros problemas de procesamiento . . . 8
- ▶ Investigación para reducir la viscosidad del petróleo pesado a través de la formación de la emulsión de aceite-agua, utilizando una mezcla emulsionante bioquímica. . . . . 9
- ▶ El artículo debate y propone el método de pirólisis en superficie, el cual no sólo disminuye la viscosidad del crudo temporalmente sino que la mejora . . . . . 9
- ▶ Reporte de un estudio experimental donde se detectan condiciones óptimas de operación y selección de un catalizador para el proceso THAI con catálisis . . . . . 9
- ▶ Flujo bifásico de crudo pesado-agua a partir de tubería horizontal. Se observó presencia de emulsiones agua en aceite y tipos de flujo debido a las velocidades de mezcla de fases. . . 10
- ▶ La combustión *in-situ* (ISC) es un método de recuperación mejorada de petróleo que implica transporte de masas acopladas, equilibrio de fase fluida y reacciones químicas. . . . . 10
- ▶ Reporte de los resultados de mejoramiento *in-situ* de crudo mediante inyección de catalizadores ultradispersantes (nano catalizadores) e hidrógeno, en un medio saturado con bitumen de Athabasca. . . . . 10
- ▶ Estudio del cambio en estabilidad de los residuos durante lechada de fases en la reacción de hidrocrackeo, en donde la formación de coque es limitada por H<sub>2</sub> y por un catalizador, de tal manera que el periodo de inducción de coque se prolonga y se reduce significativamente . . 11

#### Patentes

- ▶ La composición química de muestras de petróleo se mide utilizando la espectrometría de masas Orbitrap con ionización por electrospray (ESI), y para determinar otro tipo de análisis de mayor resolución y costo se justifican . . . . . 14
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- ▶ Proceso para reducir la viscosidad de crudos pesados *in situ*, a través de “reducción de viscosidad suave”, utilizando una planta de concentración solar. . . . . 14
- ▶ Proceso de recuperación del reservorio *in-situ* para extraer el betún de petróleo pesado o de un depósito utilizando primero un pozo horizontal en la parte superior y posteriormente otro inclinado en la parte inferior. . . . . 14

## ARTÍCULOS

Esta sección recopila artículos de diversas fuentes, mismas que son identificadas en cada caso. Los documentos referidos pueden ser de acceso restringido. Si algún artículo es de su interés, favor de contactar a:

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### Materiales para la elaboración de concreto aislante térmico

#### Cálculos básicos del ciclo de vida en la construcción para disminuir la contribución al cambio climático — Estudio de caso sobre un edificio de oficinas en Suecia

This study examined whether simplified life cycle-based calculations of climate change contributions can provide better decision support for building design. Contributions to climate change from a newly built office building in Gävle, Sweden, were studied from a life cycle perspective as a basis for improvements. A basic climate and energy calculation tool for buildings developed in the European project ENSLIC was used. The study also examined the relative impacts from building material production and building operation, as well as the relative importance of the impact contributions from these two life cycle stages at various conditions. The ENSLIC tool calculates operational energy use and contributions to climate change of a number of optional improvement measures. Twelve relevant improvement measures were tested. The most important measures proved to be changing to CO<sub>2</sub> free electricity, changing construction slabs from concrete to wood, using windows with better *U*-values, insulating the building better and installing low-energy lighting and white goods. Introduction of these measures was estimated to reduce the total contribution to climate change by nearly 50% compared with the original building and the operational energy use by nearly 20% (from 100 to 81 kWh/m<sup>2</sup>yr). Almost every building is unique and situated in a specific context. Making simple analyses of different construction options showed to be useful and gave some unexpected results which were difficult to foresee from a general design experience. This process acts as an introduction to life cycle thinking and highlights the consequence of different material choices.

Fuente: *Building and Environment*, vol. 46, issue 10, October 2011, pages 1863-1871. Wallhagen, Marita; Glaumann, Mauritz; and Malmqvist, Tove.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0360132311000515>

#### Futuro prototipo de vivienda en China con estructura de bambú: evaluación del ciclo de vida del consumo de energía y de las emisiones de carbono

In this study, the material-based energy use and carbon emission over the life cycle of a bamboo-structure residential building prototype with innovative insulation technologies are analyzed. In comparison with a typical brick-concrete building, the bamboo-structure building requires less energy and emits less carbon dioxide to meet the identical functional requirements,

i.e., envelope insulation and structure supporting. In order to systematically assess the energy use and carbon emission, several scenarios are designed based on the LEED standard and the technical potentials. The results indicate that there is a potential to reduce 11.0% (18.5%) of the embodied energy (carbon) for the use of recycled-content building materials and 51.3% (69.2%) for the recycling of construction and demolition waste, respectively. However, the practical effect of the potentials varies significantly depending on project management levels and available technologies in the current market. The analysis provides an insight into the assessment of the material-based energy use and carbon emission over the life cycle of a building.

Fuente: *Energy and Environment*, vol. 46, issue 10, October 2011, pages 2638-2646. Yu, Dongwei; Tan, Hongwei; and Ruan, Yingjun.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0378778811002623>

#### Materiales y soluciones aislantes térmicos en la construcción tradicionales, del estado de la técnica y futuros: propiedades, requerimientos y posibilidades

The advantages and disadvantages of the thermal building insulation materials and solutions have been treated. Both traditional, state-of-the-art and possible materials and solutions beyond these have been investigated. Examples of these may be mineral wool, expanded polystyrene, extruded polystyrene, polyurethane, vacuum insulation panels, gas insulation panels, aerogels, and future possibilities like vacuum insulation materials, nano insulation materials and dynamic insulation materials. Various properties, requirements and possibilities have been compared and studied. Among these are thermal conductivity, perforation vulnerability, building site adaptability and cuttability, mechanical strength, fire protection, fume emission during fire, robustness, climate ageing durability, resistance towards freezing/thawing cycles, water resistance, costs and environmental impact. Currently, there exist no single insulation material or solution capable of fulfilling all the requirements with respect to the most crucial properties. That is, for the buildings of today and the near future, several insulation materials and solutions are used and will have to be used depending on the exact circumstances and specifications. As of today, new materials and solutions like e.g. vacuum insulation panels are emerging, but only slowly introduced in the building sector partly due to their short track record. Therefore it will be of major importance to know the limitations and possibilities of all the insulation materials and solutions, i.e. their advantages and disadvantages. In this respect new conceptual thermal building insulation materials are also discussed.

Fuente: *Energy and Buildings*, vol. 43, issue 10, October 2011, pages 2549-2563. Bjørn Petter Jelle.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0378778811002295>

### **Efecto del aislamiento superficial en presas de concreto compacto rodado en regiones frías**

Superficial insulation is often used to prevent cracking of concrete dams located in cold regions. In this study, surface temperatures with and without heat insulation during the overwintering period are calculated. Using the material properties of roller-compacted concrete (RCC) as bases, we simulate and analyse the temperature field and thermal stress of certain RCC gravity dams in cold regions. The simulation and analysis are performed by three-dimensional finite element relocating mesh method under the following conditions: under the absence of heat insulation, and with the application of a 5 or 8 cm polystyrene slab for heat conservation. Moreover, the effects of superficial insulation and different thicknesses on the temperature field and thermal stress are analysed. Results show that superficial insulation can considerably increase the superficial temperature of RCC dams in cold regions, thereby decreasing superficial temperature difference and maximal tensile stress. These conditions prevent surface cracks from forming.

Fuente: *Advances in Engineering Software*, vol. 42, issue 11, November 2011, pages 939-943. Xiao-fei Zhang, Shou-vi Li, Yan-long Li, Yao Ge and Hui Li.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0965997811001657>

### **Nuevo método para mejorar las propiedades aislantes térmicas de la ceniza volante**

In the autoclaved aerated concrete production, aluminum powder is used to create pores which lead to high thermal insulation property. In the present technique developed, snow or crushed ice is added to fly ash over optimum moisture content and compacted to obtain an increased porosity and a stronger matrix. The main objective of this study is to investigate the effect of various practical mix percentages of snow into fly ash and evaluation of their insulation properties. The optimum water content of fly ash was determined and additional snow with percentages of 10, 20 and 30 by weight are added to type C fly ash samples. Thermal conductivity tests were performed on samples to evaluate the insulation capability of the snow added fly ash samples where information is not readily available in the literature. The highest improvement in the thermal conductivity is obtained by adding 20 per cent snow to fly ash samples over optimum moisture content. Higher percentages of snow addition resulted in interconnected voids, causing lower thermal conductivity performance. These findings can be utilized for nonstructural insulating construction blocks and also as an insulation layer for embankments in permafrost areas.

Fuente: *Energy and Buildings*, vol. 43, issue 11, November 2011, pages 3236-3242. Altug Saygilia and Gökhan Baykalb.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0378778811003744>

### **Correlación entre los límites de la transmitancia térmica de paredes y techos, la orientación y la absorción de energía solar**

The presented research addresses the association of maximum thermal transmittance ( $U$  value) of walls and roofs with orientation and solar absorption. The study is performed on walls and a roof typically used in Kuwait when subjected to local hot climate conditions. A computer program employing the total equivalent temperature difference (TETD) method is developed to estimate the  $U$  values corresponding to solar absorption coefficients ranging from 0 to 1. At zero solar absorption coefficient, the maximum  $U$  values stipulated in the existing national energy code are used to induce the constant total daily heat flux for the developed correlations. Furthermore, the thermal inertia parameters affected by the established  $U$  values are also predicted. The results show that the orientation and absorption coefficient have a profound effect on the  $U$  value particularly for the roof and west and east wall orientations. Moreover, the decrease in the thermal transmittance significantly enhances the thermal inertia parameters of the aerated autoclaved concrete wall type. The developed correlations can be added to the Kuwait building energy code to extend the application scope of the  $U$  value limits based on surface orientation and external solar properties.

Fuente: *Energy and Buildings*, vol. 43, issue 11, November 2011, pages 3173-3180. E.O. Assem, Building and Energy Technologies Department, Kuwait Institute for Scientific Research.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0378778811003495>

### **Secuestro de CO<sub>2</sub> mediante algas para la producción de biocombustibles**

#### **Preparándose para la captura y almacenamiento de CO<sub>2</sub> mediante un “CCS Ready Hub”: caso de estudio de la ciudad Shenzhen en la provincia Guangdong de China**

China has been building approximately 1 GW of new coal-fired power plant per week since 2005. Power plants now in construction may continue to operate until 2040. “CCS (Carbon Capture and Storage) Ready” enables and eases the subsequent retrofitting of a plant to be able to capture carbon dioxide later in that plant’s lifetime. Building on the definitions of the IEA GHG (IEA Greenhouse Gas Programme) and GCCSI (Global Carbon Capture and Storage Institute), this study suggests a novel concept ‘CCS Ready Hub’ for implementing CCS Ready. A CCS Ready Hub not only includes a number of new coal-fired power plants but also integrates other existing stationary carbon dioxide emissions sources into the planning

for potential infrastructure. We conducted a case study of Guangdong province in China with a detailed engineering and economic assessment in Shenzhen City. The study first reviewed the potential storage sites and analysed the existing stationary emissions sources in Guangdong using a GIS (Geographic Information System) approach. Thereafter, we focused on investigating the economic benefits of a 'CCS Ready Hub' at a potential 4 GW new USCPC (ultra-supercritical pulverised coal-fired) power plant in Shenzhen. Using the cost of carbon dioxide avoidance in 2020 as a criterion, we found that the concept of a CCS Ready Hub to finance CCS Ready at a regional planning level rather than at an individual plant is preferred since it significantly reduces the overall cost of building an integrated CCS system to reduce carbon emissions in the future. © 2011 Elsevier Ltd. (41 refs.)

Fuente: *Energy*, vol. 36, issue 10, October 2011, pages 5916-5924. Li, Jia; Liang, Xi; and Cockerill, Tim.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0360544211005706>

#### **Investigación experimental sobre disolución de elementos traza en dióxido de carbono y su aplicación en el almacenamiento geológico del CO<sub>2</sub>**

This paper presents the first experimental data for the fractionation of Fe, Cu and Zn between brine and carbon dioxide at pressure-temperature conditions applicable to the saline aquifers used for the geological storage of CO<sub>2</sub>, in order to evaluate the potential for trace element remobilization within the injected CO<sub>2</sub> plume. The study was carried out at 6.5-16MPa and 60°C in a large-volume autoclave, which was loaded with pressurized CO<sub>2</sub> and a 20 wt% NaCl solution having a known concentration of Fe, Cu or Zn. Paired samples of brine and CO<sub>2</sub> were extracted from separate capillary lines and analyzed for metal concentrations. The brine-CO<sub>2</sub> partition coefficients ( $D_i^{V/L} = C_i^V / C_i^L$ ) calculated from the experimental data ranged from  $4 \times 10^{-4} - 1 \times 10^{-3}$  for Fe,  $8 \times 10^{-5} - 7 \times 10^{-4}$  for Cu,  $4 \times 10^{-6} - 2 \times 10^{-4}$  for Zn, and  $6 \times 10^{-6} - 5 \times 10^{-4}$  for Na. The fractionation of these elements into the CO<sub>2</sub> did not cause a measurable decrease of their concentrations in the brine. The total element concentrations in the CO<sub>2</sub> samples ranged from 0.2 to 0.6 mg/kg (ppm) Fe, 0.1 to 0.6 mg/kg Cu, 0.004 to 0.4 mg/kg Zn and 0.4 to 39 mg/kg Na, with the Na concentrations generally displaying a positive correlation to CO<sub>2</sub> density. The values of  $D_i^{V/L}$  in a typical CO<sub>2</sub> storage reservoir at 7.0-28.5 MPa and 35-98°C, in which the density of CO<sub>2</sub> is  $\sim 0.3-0.7$  g/cm<sup>3</sup> (as compared to 0.1-0.6 g/cm<sup>3</sup> in this study), could be expected to be approximately equivalent to those determined in this study. Considering the metal concentrations typical of brines in CO<sub>2</sub> storage aquifers that have reacted with CO<sub>2</sub> and sandstone (20-200 mg/kg Fe, 0.3-1mg/kg Cu, 3-5 mg/kg Zn), these results suggest that a plume of injected CO<sub>2</sub> could contain up to 0.1 mg/kg Fe, 0-3 µg/kg (ppb) Cu and 1 µg/kg Zn, in addition to 16 mg/kg Na. In a Sleipner (North Sea)-sized reservoir used to store 14 Mt of CO<sub>2</sub>, this would lead to the mobilization of about 1t Fe, 5-10 kg Cu and Zn, and 200t Na. In terms of long-

term CO<sub>2</sub> storage, the potential consequences of these results include the precipitation of carbonate minerals in shallower, more distal regions of the aquifer and the transferral of metals to adjacent aquifer systems. © 2011 Elsevier B.V. (74 refs.)

Fuente: *Chemical Geology*, vol. 289, issue 3-4, October 23 2011, pages 224-234. Rempel, Kirsten U.; Liebscher, Axel; Heinrich, Wilhelm; and Schettler, Georg.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0009254111003238>

#### **Cuantificación de la incertidumbre de datos y su aplicación en el proceso de almacenamiento de dióxido de carbono en formaciones geológicas**

Model-based uncertainty analysis can help to judge the potentials and hazard in many engineering applications better. This requires to specify the probability distributions of all model parameters, posing a huge demand on data availability or requiring highly subjective assumptions on distribution shapes to compensate for missing data. We present a minimally subjective approach for uncertainty quantification in data-sparse situations, based on a new and purely data-driven version of polynomial chaos expansion (PCE). It avoids the subjectivity that is otherwise introduced when choosing among a small limited number of theoretical distribution shapes to represent natural phenomena: we only demand the existence of a finite number of statistical moments, and do not require knowledge or even the existence of probability density functions for input parameters. In a small fictitious example with independent experts, otherwise, we demonstrate that this subjectivity can easily lead to substantial prediction bias, and that the subjective choice of distribution shapes has a similar relevance as uncertainties due to physical conceptualization, numerical codes and parameter uncertainty. With our approach we can directly and most flexibly use raw data sets available from global databases or soft information from experts in the form of arbitrary distributions or statistical moments. We illustrate and validate our proposed approach by a comparison with a Monte Carlo simulation using a common 3D benchmark problem for CO<sub>2</sub> injection, which is a low-parametric homogeneous system. We obtain a significant computational speed-up compared with Monte Carlo as well as high accuracy even for small orders of expansion, and show how our novel approach helps overcome subjectivity. © 2011 Elsevier Ltd. (43 refs.)

Fuente: *Advances in Water Resources*, vol. 34, issue 11, November 2011, pages 1508-1518. Oladyshkin, S.; Class, H.; Helmig, R.; and Nowak, W.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0309170811001540>

#### **Desarrollo de un modelo lineal predictivo para el secuestro de CO<sub>2</sub> en acuíferos salinos profundos**

CO<sub>2</sub> injection into deep saline aquifers is a preferred method for mitigating CO<sub>2</sub> emission. Although deep saline aquifers are

found in many sedimentary basins and provide very large storage capacities, several numerical simulations are needed before injection to determine the storage capacity of an aquifer. Since numerical simulations are expensive and time-consuming, using a predictive model enables quick estimation of CO<sub>2</sub> storage capacity of a deep saline aquifer. In order to create a predictive model, the ranges of variables that affect the CO<sub>2</sub> storage capacity were determined from published literature data. Correlations found in literature were used for other important parameters such as pore volume compressibility and density of brine. Latin hypercube space filling design was used to construct 100 simulation cases prepared using CMG STARS. The simulation period covered a total of 300 years of CO<sub>2</sub> storage. By using a least-squares method, linear and nonlinear predictive models were developed to estimate CO<sub>2</sub> storage capacity of deep saline carbonate aquifers. Numerical dispersion effects were considered by decreasing the grid dimensions. It was observed that a dimensionless linear predictive model is better than the nonlinear. The sensitivity analyses showed that the most important parameter that affects CO<sub>2</sub> storage capacity is depth. Most of the (up to 90%) injected gas dissolved into the formation water and a negligible amount of CO<sub>2</sub> reacted with carbonate.

Fuente: *Computers and Geosciences*, vol. 37, issue 11, November 2011, pages 1802-1815. Anbar, Sultan and Akin, Serhat.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0098300411001142>

### Alternativas tecnológicas sobre **aseguramiento de flujo para petróleo crudo pesado y extrapesado**

#### **Desestabilización térmica de bitumen en emulsiones de agua. Estudio de tensiometría**

Nonionic surfactant-stabilised oil-in-water emulsions offer a potentially useful vehicle for transporting heavy crude oils from oilfields to refineries or distribution terminals. Prior to refining, separation of the oil from the emulsion is necessary. Previous studies have suggested that heating the emulsion is sufficient for destabilisation and recovery of the oil. The present work examines this process on a batch laboratory scale and monitors the effect of thermal treatment on the heavy oil/water interfacial tension using spinning drop tensiometry. The present research has confirmed that heating Wolf Lake (Canada) bitumen-in-water emulsions to a temperature close to the cloud point of the surfactant results in efficient bitumen/water resolution, together with separation of a dense surfactant-rich coacervate phase that could be recycled in a commercial heavy oil transportation process. The corresponding temperature dependence of the bitumen/water interfacial tension provides further insight into the emulsion resolution process.

Fuente: *Fuel*, vol. 90, issue 10, October 2011, pages 3028-3039. Spencer E. Taylor.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0016236111003012>

#### **Inyección de vapor sobre solvente en yacimientos fracturados (SOS-FR) como un nuevo enfoque para la recuperación de crudo pesado y bitumen: Una visión general del método**

Heavy-oil recovery from tight naturally fractured carbonate reservoirs is a great challenge to the oil industry, yet no well-established recovery technique has been adopted by the oil industry. Steam-over-solvent injection in fractured reservoirs (SOS-FR) is a new technology proposed as an alternative method to the sole injection of steam or solvent, and this paper introduces this method through extensive experimental evidence and analysis. The method consists of three phases: (1) steam (or hot water), (2) solvent, and (3) steam (hot water) injection. Phase 1 produces heavy oil by thermal expansion and conditions the oil for phase 2, which is solvent injection. Phase 3 is applied mainly to retrieve the solvent. Several static experiments were conducted mainly to test four critical parameters: (1) wettability of the matrix, (2) solvent type, (3) initial water saturation, and (4) matrix boundary conditions. This was followed by several dynamic experiments, which were aimed at testing the effect of the solvent injection rate on the process. All three phases yielded above 90% recovery, with 85–90% solvent retrieval if the matrix boundary conditions were favorable (large surface area per volume for effective solvent diffusion), when heptane was used as the solvent, regardless of the wettability of the matrix. After provision of the experimental results, we discuss the up- and downsides of the technology and suggest ways to improve it. The importance of this work is that it provides a novel perspective on the interaction between steam/solvent and heavy oil in the matrix and presents an alternative technique for heavy-oil recovery from deep naturally fractured reservoirs with a tight and oil-wet matrix.

Fuente: *Energy and Fuels*, vol. 25, issue 10, October 2011, pages 4528-4539. Al-Bahlani, Al-Muatasim, and Babadagli, Tayfun.

Leer completo en: <http://pubs.acs.org/doi/abs/10.1021/ef200809z>

#### **Síntesis de compuestos aromáticos alquilados modelo para facilitar la caracterización espectral de masas de los aceites pesados, residuos y bitumen**

This study summarizes the synthesis of model compounds. Long-chain alkyl multi-ring heteroaromatics are the synthetic targets. These compounds are considered analogues of similar compounds that are present at abundant levels in petroleum crude oils, resids, heavy oils, deasphalted oils, asphaltenes, and bitumens, and they are responsible for coke formation and other processing problems. Model compounds are not readily available. Some models have been synthesized to approximate the physical and chemical behavior of real asphaltenes, but the structures are not completely consistent with the current structural understanding. The composition of petroleum crudes, resids, heavy oils, and bitumens has been a subject of intense



research for years. The structure of these coke-forming molecules is generally thought to be an aromatic core of critical molecular weight and number of fused aromatic rings. This critical ring number is around 4–5 fused aromatic rings, which bear alkyl side chains and heteroatoms. This general structural view is still being improved. During coking, these side chains thermally cleave off of the aromatic core and leave the coker as volatile liquids and gas. The aromatic cores are thermally stable, and they are not volatile. They remain in the coker until they condense and form low-value coke. The purpose of this research was to synthesize model compounds representing the molecular structure of the coke-forming molecules. These compounds will be used to model the behavior of resids, heavy oils, and bitumens to understand their processing chemistry and their physical and chemical properties. Model compounds that reasonably represent the structural data with boiling point ranges that map directly onto the boiling point ranges of real heavy oils, resids, and bitumens have been successfully synthesized. Important structural features are emphasized in these models, such as high molecular weight [ $\sim 1000$  atomic mass units (amu)] with multi-ring aromatic cores, long alkyl side chains, and the inclusion of sulfur and nitrogen. These model compounds can be used to calibrate analytical methods to provide response factors for quantitative characterization of alkylated aromatics in real petroleum fractions and to better understand thermal chemistry kinetics.

Fuente: *Energy and Fuels*, vol. 25, October 2011, pages 4600–4605. M. A. Francisco, R. Garcia, B. Chawla, C. Yung, K. Qian, K. E. Edwards, and L. A. Green.

Leer completo en: <http://pubs.acs.org/doi/abs/10.1021/ef201031f>

#### **Estabilización de emulsiones de crudo pesado en agua usando una mezcla de emulsificantes bioquímicos**

In this study, the viscosity reduction of heavy oil has been investigated through the formation of oil-water emulsion using a bio/chemical emulsifier mixture. Four bioemulsifiers from indigenous *Rhodococcus erythropolis* and *Bacillus licheniformis* strains were used to stabilize a highly-viscous oil-in-water emulsion. The Taguchi method with an  $L_9$  orthogonal array design was used to investigate the effect of various control factors on the formation of the oil/water emulsions. An emulsion with lowest viscosity was formed using ACO4 strain. The substantial stability of the oil-in-water emulsion allows the heavy oil to be transported practically over long distances or remain stationary for a considerable period of time prior to utilization. As the result of Taguchi analysis, the temperature and concentration of the emulsifier had a significant influence on viscosity reduction of the emulsion.

Fuente: *Chemical Engineering & Technology*, vol. 34, issue 11, November 2011, pages 1807–1812. Afshin Farahbakhsh, Majid Taghizadeh, Bagher Yakhchali, Kamyar Movagharnjad.

Leer completo en: <http://onlinelibrary.wiley.com/doi/10.1002/ceat.201100169/pdf>

#### **Modelado de mejoramiento *in-situ* de aceite extrapesado de arenas bituminosas mediante pirólisis subsuperficial**

In order to enhance extra heavy oils and tar sands recovery, steam injection has become popular as it decreases bitumen viscosity via increase of formation temperature. However, such process comes with some drawbacks such as the necessity to dispose of substantial nearby quantity of water, the impossibility to 100% recycle this water, and the co-generation of a significant quantity of acid gases. Moreover the resulting hydrocarbons are still extra heavy oil/bitumen with all the constraints it implies in terms of pipe transport and refining. For these reasons, the development of the process of In-Situ Upgrading (IUP) by Subsurface Pyrolysis is debated. The idea would be to sufficiently heat the formation in order to pre-upgrade the oil *in-situ*; instead of just temporarily decreasing its viscosity. The process can be highly energy consuming but would offer multiple potential advantages such as production of a higher quality product with already a high commercial value, reduction of required infrastructure and expenses on production site for dilution or pre-upgrading before pipe transport, and no use of water, etc. This study presents the feasibility of such IUP process by performing a core experiment under reservoir conditions. First, a compositional kinetic model is developed in order to correctly predict the products composition during pyrolysis; which is then validated using laboratory data. This is a key element in an IUP process as the results of kinetic model gives an idea of better designing the core experiment, who can properly mimic reservoir behavior. The experimental results are promising in terms of upgraded oil production i.e. light cuts, acid gases, pyrobitumen with proper thermal front propagation. It showed that with time and temperature there will be production of large quantity of light components, light cuts, and while generated pyrobitumen will remain be in the core. This means that at constant temperature, sufficiently higher for pyrolysis; longer the duration of the experiment more will be the production of light cuts due to cracking of heavy components. These results provide key elements to extend the approach to a larger scale for field test application.

Fuente: *Society of Petroleum Engineers*, Canadian Unconventional Resources Conference, 15 -17 November 2011, Alberta, Canadá. Jitendra KUMAR, Luc FUSETTI and Bernard CORRE, TOTAL E&P.

Leer completo en: <http://www.onepetro.org/mslib/app/Preview.do?paperNumber=SPE-149217-MS&societyCode=SPE>

#### **Optimización experimental de procesos catalíticos para el mejoramiento *in-situ* de petróleo pesado y bitumen**

The worldwide conventional crude-oil demand is on the rise, and because of the rising prices, unconventional oils are becoming more economically attractive to extract and refine. However, technological innovation is needed if heavier oil supplies are to be exploited further. Toe-to-heel air injection (THAI)

and its catalytic add-on processes (CAPRI) combine in-situ combustion with catalytic upgrading using an annular catalyst packed around the horizontal producer well. These techniques offer potentially higher recovery levels and lower environmental impact than alternative technologies (e.g., steam-based techniques). An experimental study is reported concerning the optimization of catalyst type and operating conditions for use in the THAI-CAPRI process. The feed oil was supplied from the Whitesands THAI-pilot trial. Experiments were carried out using microreactors containing 10 g of catalyst, with oil flow of 1 mL/min and gas flow of 0.5 L/min, under different temperatures, pressures, and gas environments. Catalysts tested included alumina-supported CoMo, NiMo, and ZnO/CuO. It was found that there was a trade-off in operation temperature between upgrading performance and catalyst lifetime. At a pressure of 20 bar, operation at 500°C led to an average of 6.1°API upgrading of THAI oil to 18.9°API, but catalyst lifetime was limited to 1.5 hours. Operation at 420°C was found to be a suitable compromise, with upgrading by an average of 1.6°API, and sometimes up to 3°API, with catalyst lifetime extended to 77.5 hours. Coke deposition occurred within the first few hours of the reaction, such that the catalyst pore space became blocked. However, upgrading continued, suggesting that thermal reactions or reactions catalysed by hydrogen transfer from the coke itself play a part in the upgrading reaction mechanism. The CAPRI process was relatively insensitive to changes in reaction-gas medium, gas-flow rate, and pressure, suggesting that the dissolution of hydrogen or methane from the gas phase does not play a key role in the upgrading reactions. By careful control of the temperature and oil-flow rate in the in-situ CAPRI process, additional upgrading compared with the THAI process alone may be effected, resulting in a more-valuable produced oil, which is easier to transport.

Fuente: *Society of Petroleum Engineers*, vol. 50, issue 11, November-December 2011, pages 33-47. Shah, A.; Fishwick, R.P.; Leeke, G.A.; Wood, J.; Rigby, S.P.; and Greaves, M.

Leer completo en: <http://www.onepetro.org/mslib/app/Preview.do?paperNumber=SPE-136870-PA&societyCode=SPE>

#### **Investigación sobre flujo bifásico crudo pesado-agua y las características de flujo relacionados**

In this paper, heavy crude oil-water flows are studied in a horizontal stainless steel test section with 25.4 mm ID and overall length of 50 m. Crude oil (viscosity = 628.1 mPa s, interfacial tension with water = 10.33 mN/m at 60 °C) and water, collected from an oilfield, were used as test fluids. Visual observations, local sampling and pressure drop measurements were used to identify the flow patterns and their transitions. It was found that in all conditions studied there was a water-in-oil emulsion present. At low mixture velocities and water fractions this occupied the whole pipe cross section. As the velocity or the volume fraction increased water appeared to segregate. At high water fractions and mixture velocities annular flow appeared with the water-in-oil emulsion in the core surrounded by a water layer. The results were compared with

those from a model oil with the same viscosity. At low water fractions there was a similarity between the patterns observed with the two oil systems characterized by water segregation from an oil continuous dispersion with increasing water fraction or mixture velocity. However, at high water fractions an oil-in-water dispersion formed with the model oil that was not seen with the crude oil. Pressure drop was generally higher for the crude oil system compared to the model one, while in both cases it decreased when water started to segregate and form layers in contact with the pipe wall. The differences between the two oil systems are attributed to the natural surfactants present in the heavy crude oil (such as asphaltenes and resins), which tend to accumulate on the water/oil interface, retard film drainage and maintain the stability of water drops in oil.

Fuente: *International Journal of Multiphase Flow*, vol. 37, issue 9, November 2011, pages 1156-1164. Wei Wang, Jing Gong, and Panagiota Angeli.

Leer completo en: <http://www.sciencedirect.com/science/article/pii/S0301932211001182>

#### **Oxidación cinética de crudo pesado. Ecuación completa del modelo de estado**

In-situ combustion (ISC) is an enhanced oil recovery method that involves coupled mass transport, fluid phase equilibria, and chemical reactions. Because of its complexity, a full understanding of ISC process phenomena and their modeling remains an open research topic. Ramped temperature oxidation (RTO) of crude oil is one of the methods to obtain the kinetics of oxidation. This paper provides a new method to interpret such RTO experiments and then gives an improved physical understanding compared with classical analytical methods. The reactor model is based on a compositional and full equation of state formulation. The numerical model is applied to a synthetic test case. Although generally not taken into account, this work shows that spatial transport effects are present despite the plug flow design of typical RTO reactors. Moreover, coupling between thermodynamics and chemistry is important even for extra-heavy oil that in a first approximation could be seen as totally nonvolatile.

Fuente: *Energy and Fuels*, vol. 25, issue 17, November 2011, pages 4886-4896. Lapene, Alexandre; Debenest, Gerald; Quintard, Michel; Castanier, Louis; Gerritsen, Margot; and Kovscek, Anthony R.

Leer completo en: <http://pubs.acs.org/doi/full/10.1021/ef200365y>

#### **Estudio experimental de la recuperación y mejoramiento simultáneo del bitumen de Athabasca usando inyección de catalizadores ultradispersos**

The worldwide global demand for oil has grown to 80 million barrels per day, and is estimated to grow by 50% in next 20 years while conventional resources are declining. Unconventional reserve of heavy oil and bitumen has been considered as long

term replacement for conventional resources. There are a large number of research projects in order to achieve this goal with technological efficiency. In situ upgrading of heavy oil and bitumen using Ultra Dispersed (UD) submicronic catalysts is a promising idea to improve the quality of produced liquid. In this process, hydrogen and a catalytic suspension are injected to the reservoir to react with heavy oil in the porous media. Nano catalyst particles enhance the recovery of oil by viscosity reduction. Series of experiments have been designed in an elemental model under typical reservoir condition. Tests are performed at a pressure of 500 Psi, residence time of 36 h, and temperatures from 300 to 340°C. This paper presents the results of the in situ upgrading obtained along with the recovery of bitumen evidenced using ultra dispersed catalysts in an experimental rig. These experiments involve the injection of UD catalyst particles and hydrogen into a sand pack which is saturated with Athabasca bitumen. Produced liquids were analyzed with different techniques and results were demonstrated in recovery curves. Also, results of each experiment have been compared with base steam injection case to evaluate recovery performance of the catalyst suspended in a hot fluid. Temperature profile distributions and produced gas analysis are demonstrated to justify the quality of reaction through porous media. Produced liquids from media have higher API gravity and lower viscosity which shows a successful in situ upgrading process.

Fuente: *Society of Petroleum Engineers*, Canadian Unconventional Resources Conference, 15 -17 November 2011, Alberta, Canadá. R. Hashemi and P. Pereira.

Leer completo en: <http://www.onepetro.org/mslib/app/Preview.do?paperNumber=SPE-149257-MS&societyCode=SPE>

### **Cambio de la estabilidad de asfaltenos en los residuos durante la fase de hidrocrackeo**

Asphaltenes play a key role in the stability of the residue during processing. When asphaltenes reach their solubility limit in the residue, they would begin to aggregate, so that a new phase, called the mesophase, would separate from the oil phase, which eventually leads to coke formation. To relate coking characteristics, the changes in stability of the residue were studied during a slurry-phased hydrocracking reaction. The results indicated that the coke formation is obviously restrained by H<sub>2</sub> and a catalyst such that the coke induction period is prolonged and the coke content is also reduced significantly compared to the coke content only in the presence of H<sub>2</sub>. The colloidal stability parameters (CSPs) determined by means of flocculation onset titration and the colloidal stability function (CSF) calculated on the basis of saturate, aromatic, resin, and C<sub>7</sub>-asphaltene (SARA) composition of the residue have a similar variation trend, which could be related to coking characteristics. First, the coking onset and the maximum asphaltene content in the residue were in correspondence with the turning point in the downward trend of the stability of the residue. The stability of the residue deteriorated significantly during the coke induction period, and the decreased trend tended to smooth after the coking onset point. Second, it is confirmed that the downward trend of stability is inhibited effectively in the presence of H<sub>2</sub> and a catalyst, so that the ability of the residue against thermal disturbance is enhanced to reduce the coke formation. The changes in structure parameters of asphaltenes also showed that the catalyst could inhibit or delay the excessive condensations of asphaltenes to reduce the coke formation.

Fuente: *Energy and Fuels*, vol. 25, November 2011, pages 5360–5365, Wenan Deng, Hui Luo, Jingjie Gao, and Guohe Que.

Leer completo en: <http://pubs.acs.org/doi/abs/10.1021/ef201114t>

## PATENTES

Esta sección recopila patentes de diversas fuentes, mismas que son identificadas en cada caso. Los documentos referidos pueden ser de acceso restringido. Si alguno es de su interés, favor de contactar a:

→ Act. Raúl Espinosa (55) 5623 3500 ext. 1455 / [raul.espinosa@alianzafidem.org](mailto:raul.espinosa@alianzafidem.org)

### Materiales para la elaboración de concreto aislante térmico

#### Concreto poroso térmico

No de Publicación: DE102010013667

Inventores:

Compañía: Xella Technologie Und Forschungsgmbh [De]

Aerated concrete molded body (I) comprising calcium silicate hydrate bar framework, preferably a tobermorite bar framework, and pores, is claimed, where the aerated concrete molded body exhibits an A-number of above 1600, a thermal conductivity of  $\approx 0.085$  W/mK and at least a compressive strength of 1.6 N/mm<sup>2</sup>. An independent claim is included for a process for producing comprising preparing a casting compound from at least one calcium oxide component reacting in a hydrothermal process, preferably from burnt lime, at least a cement, at least a silica component reacting in hydrothermal process, preferably in the form of quartz powder, at least a calcium sulfate component and at least a blowing agent, especially in the form of an aluminum component, and water, binging the pourable mass poured into a mold to raise and stiffen into a green cake, cutting the cake into molded bodies and curing the molded body in an autoclave, where the casting compound contains an additive to prevent the sedimentation of castable solids that contain more than 50% of a finely divided silica-component with specific surface of 8000-30000 m<sup>2</sup>/g, as measured according to Blaine, and the water/solids value is 0.8-2.

Fuente: [http://worldwide.espacenet.com/publicationDetails/biblio?CC=DE&NR=102010013667A1&KC=A1&FT=D&date=20111006&DB=EPODOC&locale=en\\_EP](http://worldwide.espacenet.com/publicationDetails/biblio?CC=DE&NR=102010013667A1&KC=A1&FT=D&date=20111006&DB=EPODOC&locale=en_EP)

#### Composición de resina en el mortero para el control de deterioro de cimientos residenciales e invasión de termitas

No de Publicación: WO2011136219

Inventores: Shigemura Takahiro [Jp]; Tatsuta Ryoji [Jp]

Compañía: Sumika Enviro Science Co Ltd [Jp]; Takeya Chemical Lab Co Ltd [Jp]; Sumitomo Chemical Co [Jp]; Shigemura Takahiro [Jp]; Tatsuta Ryoji [Jp]

Disclosed is a technique for achieving both the prevention of the deterioration of a residence foundation concrete and the prevention of the invasion of termites at the same time. Specifically disclosed is a resin mortar composition comprising, as essential components, a cement, a fine aggregate, a resin and an insecticidal compound that is a powder having a solid state at ambient temperature. It is preferred that the resin be an acrylic resin or an ethylene-vinyl acetate copolymer or a mixture thereof and the insecticidal compound be coated with an urethane resin and/or a urea resin. Also specifically disclosed are:

a residence foundation protection construction method using the resin mortar composition; and a termite control method using the resin mortar composition.

Fuente: [http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=5&adjacent=true&locale=en\\_EP&FT=D&date=20111103&CC=WO&NR=2011136219A1&KC=A1](http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=5&adjacent=true&locale=en_EP&FT=D&date=20111103&CC=WO&NR=2011136219A1&KC=A1)

#### Composición de geopolímeros

No de Publicación: US 2011271876

Inventores: Alter Stephen [Gb]; Wright Michael [Gb]

Compañía:

The present invention relates to geopolymer compositions, methods of producing the compositions, and uses thereof. The geopolymer compositions broadly are comprised of a geopolymer binder and an aggregate and, once cured, can exhibit compressive strengths in excess of that of Portland cement-based formulations. The geopolymer composition of the present invention adheres to most surfaces and can be used in the formation of a mortarless building block, floor screed, bench, building block brick, support column or pre-molded column, beam, paving stone, tiles, stone accouterment for a garden, countertop, bathtub, sink, a geopolymer slab, a structural geopolymer composition, a reinforced geopolymer composition, a steel reinforced geopolymer composition, or as a substitute for structural in foundations, beams, columns, or slab with the addition as necessary of steel reinforcement.

Fuente: [http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=2&adjacent=true&locale=en\\_EP&FT=D&date=20111110&CC=US&NR=2011271876A1&KC=A1](http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=2&adjacent=true&locale=en_EP&FT=D&date=20111110&CC=US&NR=2011271876A1&KC=A1)

### Secuestro de CO<sub>2</sub> mediante algas para la producción de biocombustibles

#### Proceso para recuperar dióxido de carbono de mediana pureza

No de Publicación: EP 2374522 A1

Inventores: Kumar Ravi [Us]

Compañía: Praxair Technology, Inc.

The present invention generally relates to vacuum pressure swing adsorption (VPSA) processes and apparatus to recover CO<sub>2</sub> having a purity of approximately  $\geq 80$  mole% from streams containing at least CO<sub>2</sub> and H<sub>2</sub> (e.g., syngas). The feed to the CO<sub>2</sub> VPSA can be at super ambient pressure. The CO<sub>2</sub> VPSA unit (30) produces two streams, a H<sub>2</sub>-enriched stream (38) and a CO<sub>2</sub> product stream (36). The process cycle steps are selected such that there is minimal or no H<sub>2</sub> losses from the process.

The recovered CO<sub>2</sub> can be further upgraded, sequestered or used in applications such as enhanced oil recovery (EOR).

Fuente: [http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=EP&NR=2374522A1&KC=A1&FT=D&date=20111012&DB=EPODOC&locale=en\\_EP](http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=EP&NR=2374522A1&KC=A1&FT=D&date=20111012&DB=EPODOC&locale=en_EP)

### **Sistema y método para la captura y secuestro de dióxido de carbono**

No de Publicación: WO 2011/137398 (A1)

Inventores: Eisenberger Peter [US]

Compañía: Eisenberger Peter [US]

A method and a system capable of removing carbon dioxide directly from ambient air to obtain pure CO<sub>2</sub>. The method comprises the steps of generating heat from a production process; applying the heat to water to co-generate saturated steam, wherein said sorbent is alternately exposed to a flow of ambient air during said removal phase, thereby enabling said sorbent to sorb, and therefore remove, carbon dioxide from said ambient air, and to a flow of the co-generated steam during the regeneration and capture phase, after the sorbent has adsorbed the carbon dioxide, thereby enabling regeneration of such sorbent, and the resultant capture in relatively pure form of the adsorbed carbon dioxide. The system provides the sorbent substrate and equipment for carrying out the above method, and provides for obtaining purified carbon dioxide for further use in agriculture and chemical processes.

Fuente: [http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2011137398A1&KC=A1&FT=D&date=20111103&DB=EPODOC&locale=en\\_EP](http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2011137398A1&KC=A1&FT=D&date=20111103&DB=EPODOC&locale=en_EP)

### **Integración térmica de una unidad de captura y compresión de CO<sub>2</sub> con una planta de vapor o ciclo combinado**

No de Publicación: US 2011/265477 A1

Inventores: Drouvot Paul [Fr]; Li Hongtao [Ch]; Dietzmann Joerg [Ch]

Compañía:

A power plant system including a fossil fuel fired power plant (6) for the generation of electricity, a carbon dioxide capture and compression system (5,13), and an external heat cycle system has at least one heat exchanger (1,2,3) for the heating of the flow medium of the external heat cycle system. The heat exchanger (1,2,3) is connected to a heat flow from the CO<sub>2</sub> capture plant (5) or a CO<sub>2</sub> compression unit (13). A return flow from the heat exchanger (1,2,3) is led to the CO<sub>2</sub> capture and compression system (5,13) or to the power plant (6). The power plant system allows an increase in overall efficiency of the system.

Fuente: [http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=US&NR=2011265477A1&KC=A1&FT=D&date=20111103&DB=EPODOC&locale=en\\_EP](http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=US&NR=2011265477A1&KC=A1&FT=D&date=20111103&DB=EPODOC&locale=en_EP)

### **Captura de CO<sub>2</sub> de gases provenientes de plantas de proceso**

No de Publicación: WO 2011140117 (A2)

Inventores: Bearden Mark D. [Us] and Humble Paul H. [Us]

Compañía: Battelle Memorial Institute [US]; Bearden Mark D. [US]; and Humble Paul H. [US]

The present invention are methods for removing preselected substances from a mixed flue gas stream characterized by cooling said mixed flue gas by direct contact with a quench liquid to condense at least one preselected substance and form a cooled flue gas without substantial ice formation on a heat exchanger. After cooling additional process methods utilizing a cryogenic approach and physical concentration and separation or pressurization and sorbent capture may be utilized to selectively remove these materials from the mixed flue gas resulting in a clean flue gas.

Fuente: [http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2011140117A2&KC=A2&FT=D&date=20111110&DB=EPODOC&locale=en\\_EP](http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2011140117A2&KC=A2&FT=D&date=20111110&DB=EPODOC&locale=en_EP)

### **Secuestro de CO<sub>2</sub> utilizando aluminato tricálcico**

No de Publicación: WO 2011/137480 A1

Inventores: Rosenberg Steven, Philip [Au] and Boom, Eric, Antoinette, Jozef, Marie [Au]

Compañía: Bhp Billiton Worsley Alumina Pty Ltd [Au]; Rosenberg Steven, Philip [Au]; Boom, Eric, Antoinette, Jozef, Marie [Au]

A carbon dioxide sequestration process is disclosed. The process comprises the steps of a) introducing a source of carbon dioxide to a caustic aluminate solution to form a first treated stream comprising carbonate ions in solution and aluminium hydroxide in solid form; b) subjecting the first treated stream to solid/liquid separation to recover alumina values in the form of aluminium hydroxide and produce a first clarified treated stream; c) mixing the first clarified treated stream with tricalcium aluminate to form a second treated stream comprising calcium carbonate in solid form, aluminate ions in solution, and hydroxyl ions in solution; and, d) subjecting the second treated stream to solid/liquid separation to remove calcium carbonate within which carbon dioxide has been sequestered, and produce a second clarified treated liquor stream.

Fuente: [http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2011137480A1&KC=A1&FT=D&date=20111110&DB=EPODOC&locale=en\\_EP](http://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2011137480A1&KC=A1&FT=D&date=20111110&DB=EPODOC&locale=en_EP)

## Alternativas tecnológicas sobre **aseguramiento de flujo para petróleo crudo pesado y extrapesado**

### **Método para análisis de la composición química de la fracción de crudo pesado**

No. De Publicación: WO 2011/141826 (A1)

Inventores: Pomerantz Andrew E. [US]; Mullins Oliver C. [US]  
Compañía: Schlumberger Canada Limited; Services Petroliers Schlumberger; Schlumberger Holdings Limited; Schlumberger Technology B.V.; Prad Research And Development Limited.

The chemical composition of petroleum samples is measured using orbitrap mass spectrometry with electrospray ionization (ESI). The orbitrap measurement is used in a screening to determine if one or more higher resolution (but more expensive) compositional analyses are justified.

*Fuente:* [http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=47&adjacent=true&locale=en\\_EP&FT=D&date=20111117&CC=WO&NR=2011141826A1&KC=A1](http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=47&adjacent=true&locale=en_EP&FT=D&date=20111117&CC=WO&NR=2011141826A1&KC=A1)

### **Proceso para la producción mejorada de crudo pesado a través de microondas**

No de Publicación: US 2011/259585 (A1)

Inventores: Banerjee Dwijen K [US]; Stalder John L [US]; Sultenfuss Daniel R [US]; Menard Wendell P [US]; Dreher JR Wayne R [US]; Blount Curtis G (US)  
Compañía: CONOCOPHILLIPS CO(US)

A process for utilizing microwaves to heat H<sub>2</sub>O within a subterranean region wherein the heated H<sub>2</sub>O contacts heavy oil in the subterranean region to lower the viscosity of the heavy oil and improve production of the heavy oil.

*Fuente:* [http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=2&adjacent=true&locale=en\\_EP&FT=D&date=20111027&CC=US&NR=2011259585A1&KC=A1](http://worldwide.espacenet.com/publicationDetails/biblio?DB=EPODOC&II=2&adjacent=true&locale=en_EP&FT=D&date=20111027&CC=US&NR=2011259585A1&KC=A1)

### **Proceso para reducir la viscosidad de aceites pesados**

No de Publicación: WO 2011132056 (A2)

Inventores: Bortolo Rossella; Ricco' Moreno  
Compañía: ENI SPA

Process for reducing the viscosity of heavy crude oils in situ, directly at the well head or oil centre, through "mild visbreaking", characterized in that the energy necessary for said visbreaking is obtained by means of a solar concentration plant, before being subjected to said visbreaking, said heavy crude oils being pre-heated by at least one thermal exchange with the obtained crude oils having a reduced viscosity.

*Fuente:* [http://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20111020&DB=EPODOC&locale=en\\_EP&CC=IT&NR=MI20100660A1&KC=A1](http://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20111020&DB=EPODOC&locale=en_EP&CC=IT&NR=MI20100660A1&KC=A1)

### **Proceso de recuperación *in situ* de crudo pesado y bitumen**

No de Publicación: WO 2008/011704

Inventores: Gates Ian Donald (CA), Larter Stephen Richard (CA), Adams Jennifer Jane (CA)  
Compañía: UTI Limited Partnership

The present invention is directed to an in situ reservoir recovery process that uses a horizontal well located near the top of a reservoir and an inclined production well to extract bitumen or heavy oil from a reservoir. In a first stage, the top well is used for cold production of reservoir fluids to the surface, in which, reservoir fluids are pumped to the surface in the absence of stimulation by steam or other thermal and/or solvent injection. A lower production well is drilled into the formation below the top well. The top well is converted to an injection well or, if no cold production then a top well is drilled as an injector well. A portion of the bottom well is inclined so that one end of the incline is closer to the injector well than the other end of the incline. In the process, steam circulation creates a heated zone at the point of the two wells that are closest together in the reservoir.

*Fuente:* <http://www.wipo.int/patentscope/search/en/WO2008011704>

## EVENTOS

### Materiales para la elaboración de concreto aislante térmico

#### Asian Building Interiors 2012

4-6 de junio de 2012

Hong Kong Convention & Exhibition Centre, Hong Kong, Hong Kong (SAR)

<http://www.asianbuildinteriors.com/>

#### Building & Construction Mongolia 2012

5-7 de septiembre de 2012

Ulaanbaatar, Mongolia, Ulaanbaatar, Mongolia

<http://www.allworldexhibitions.com/industry.asp?id=3>

#### 7<sup>th</sup> Global Insulation Conference

17-18 de septiembre de 2012

Latvia-Riga, República Báltica de Letonia

<http://www.propubs.com/index.php/events/global-insulation/introduction>

#### Building & Infrastructure Indonesia 2013

11-14 de septiembre de 2013

Jakarta International Expo, Kemayoran, Jakarta, Indonesia

<http://www.buildingindonesia.com/>

### Secuestro de CO<sub>2</sub> mediante algas para la producción de biocombustibles

#### 6<sup>th</sup> Annual European Carbon Capture and Storage conference

27-28 de febrero de 2012

London, UK

<http://www.platts.com/ConferenceDetail/2012/pc265/index>

#### Carbon Forum North America 2012

1-2 de marzo de 2012

Washington, DC

<http://www.ietaforum.com/>

#### 11<sup>th</sup> Annual Conference on Carbon Capture Utilization & Sequestration

30 de abril-3 de mayo de 2012

Pittsburgh, Pennsylvania

<http://www.carbonsq.com/>

#### ASME Turbo Expo 2012

11-15 de junio de 2012

Copenhagen, Denmark

<http://www.asmeconferences.org/TE2012/index.cfm>

#### International Fair on Climate Changes, CO<sub>2</sub> Reduction, and the Carbon Credit Market, 8<sup>th</sup> edition

5-7 de septiembre de 2012

Roma, Italia

[http://www.zeroemissionrome.eu/en\\_zer/index\\_co2.asp](http://www.zeroemissionrome.eu/en_zer/index_co2.asp)

### Alternativas tecnológicas sobre aseguramiento de flujo para petróleo crudo pesado y extrapesado

#### 1<sup>er</sup> Congreso de Logística, Transporte y Distribución de Hidrocarburos

1-3 de febrero de 2012

Guadalajara, Jalisco

<http://www.expold.com.mx/convocatoria.html>

#### LACPEC (SPE Latin America & Caribbean Petroleum Engineering Conference)

16-18 de abril de 2012

Ciudad de México, México

<http://www.spe.org/events/lacpec/2012/en>

#### SPE EOR Conference at Oil and Gas West Asia

16-18 de abril de 2012

Golden Tulip Hotel, Muscat, Oman

<http://www.spe.org/events/ogwa/2012>

#### Heavy Oil World

28-31 de mayo de 2012

Dubai, UAE

<http://www.terrapinn.com/2012/howe>

#### Petroleum Exhibition & Conference of Mexico

12-14 de junio de 2012

Villahermosa, Tabasco

<http://www.citeworx.com/pecom/>

#### ONS (Offshore North Sea)

28-31 de agosto de 2012

Stavanger, Norway

<http://www.ons.no>

#### 7<sup>o</sup> Congreso Mexicano del Petróleo

10-12 de septiembre de 2012

Centro de Convenciones Banamex de la Ciudad de México, D.F.

<http://www.cmp2012.com/>

#### Athabasca Oilsands Tradeshow & Conference

10-12 de septiembre de 2012

Suncor Community Leisure Centre, Fort McMurray, Alberta, Canadá

<http://oilsandstradeshow.com/>

#### World Heavy Oil Congress

10-13 de septiembre de 2012

Aberdeen, Scotland

<http://www.worldheavyoilcongress.com>