

DIRECCIÓN DE NUEVAS CREACIONES

SOLICITUD DE PATENTE - NACIONAL

1	Tipo de solicitud	☒ Patente de invención	☐ Patente de modelo de utilidad
2	Título de la invención	3	CIP Clasificación Internacional de Patentes
REDUCCIÓN DE ARRASTRE O FRICCIÓN EN PETROLEO CRUDO PESADO CON ALTO CONTENIDO DE ASFALTENOS		Nombre	Código
		C-09-K-8-04	C09K8/04
4	Datos del Solicitante / Titular		
Nombre:		BRIAN LEWIS	Dirección Electrónica: blewis@flowchem-dra.com
Dirección:		20333 Blinka Road. Waller, 77484, TX, US	Domicilio/País de constitución: ESTADOS UNIDOS DE AMERICA - TEXAS - WALLER
Identificación: ☐ CEDULA DE CIUDADANIA ☐ EMPRESA EXTRANJERA ☒ PASAPORTE ☐ CEDULA DE EXTRANJERIA ☐ NIT Número: 428815992-			
5	Solicitantes		
Apellidos - Nombres o Razón Social		Tipo	Identificación

1.	LEWIS BRIAN	PA	428815992
6	Datos del Inventor		
Nombre:		BRIAN LEWIS	Dirección Electrónica: blewis@flowchem-dra.com
Dirección:		20333 Blinka Road., Waller, 77484, TX, US	Domicilio/País de constitución: ESTADOS UNIDOS DE AMERICA - TEXAS - WALLER
Identificación: ☐ CEDULA DE CIUDADANIA ☐ EMPRESA EXTRANJERA ☒ PASAPORTE Número: 428815992-			
7	Inventor(es)		
Apellidos - Nombres		Domicilio	
1. LEWIS BRIAN		ESTADOS UNIDOS DE AMERICA	
8	Datos Inventor(es)		
País de Residencia		Departamento/Estado	Ciudad
1. ESTADOS UNIDOS DE AMERICA		TEXAS	WALLER
			Dirección
			20333 Blinka Road., Waller, 77484, TX, US
9	Datos del Representante Legal / Apoderado		
Nombre:		ERNESTO RENGIFO GARCIA	Dirección Electrónica: erengifo@rengifoabogados.com
Dirección:		Calle 70 No. 4-36	Domicilio/País de constitución: COLOMBIA - BOGOTA D.C. - BOGOTA D.C.

Identificación:			
☒ CEDULA DE CIUDADANIA		☐ CEDULA DE EXTRANJERIA	
☐ EMPRESA EXTRANJERA		☐ NIT	
☐ PASAPORTE			
Número:		14232210-	
Presentación de Poder			
Año de Radicación			
Número de Radicación			
10	Declaraciones de prioridad		☒ SI ☐ NO
1.	(33) País de origen ESTADOS UNIDOS DE AMERICA	Codigo del país US	(31) No. Solicitud 62212584 (32) Fecha 31/08/2015
11	Declaración sobre uso de recursos genéticos o biológicos		
<i>Declaro que el objeto de la presente solicitud de patente fue obtenido a partir de recursos genéticos o biológicos de los que cualquiera de los países miembros de la Comunidad Andina es país de origen.</i> ☐ SI ☒ NO Nota: En caso afirmativo deberá anexar copia del contrato de acceso de recursos genéticos o productos derivados, o certificado o numero de registro, expedido por la Autoridad competente.			
12	Declaración sobre uso de conocimientos tradicionales		
<i>Declaro que el objeto de la presente solicitud de patente fue obtenido a partir de conocimientos tradicionales de comunidades indígenas, afroamericanas o locales de países miembros de la Comunidad Andina.</i> ☐ SI ☒ NO Nota: En caso afirmativo deberá anexar la licencia o autorización de uso de conocimiento tradicional, o certificado o numero de registro.			
13	Para publicar a partir de la fecha de publicación o de la prioridad invocada		
Si es Patente de Invención ☐ 6 Meses ☒ 12 Meses ☐ 18 Meses ☐ Otro Cual:		Si es Patente de Modelo de Utilidad ☐ 6 Meses ☐ 12 Meses ☐ Otro Cual:	
14	Reivindicaciones		
Número reivindicaciones:		4	Pago Reivindicaciones: No
15	Reducción de tasas.		
<i>Declaro que carezco de medios económicos para presentar la solicitud de patente.</i>			

☐ SI ☒ NO

Nota: En caso de ser persona natural y carecer de medios económicos, y por lo tanto, aplique la reducción de tasas a que se refiere la resolución vigente en tarifas, debe firmar la presente solicitud bajo la gravedad de juramento.

☐ Micro, pequeñas y medianas empresas

☐ Universidades públicas o privadas

☐ Entidades sin ánimo de lucro

Debe aportar los documentos que se indican en el numeral 17 de anexos

16 Documentos Anexos

☒ Reivindicaciones

☒ Descripción

☐ Dibujos y/o Figuras

☒ Resumen

☐ Certificado Deposito Materia Biologico

☐ Uso de Conocimiento tradicional

☐ Listado de secuencias

☐ Artes finales 12 x 12 cm

☐ Certificado con descuento

☒ Poderes, si fuere el caso

☐ Documento que legalmente pruebe la Cesión del inventor al solicitante o a su causante

☒ Otros anexos

REDUCCION DE ARRASTRE O FRICCION EN PETROLEO CRUDO PESADO CON ALTO CONTENIDO DE ASFALTENOS

CAMPO

[0001] La revelación se refiere a la reducción de resistencia en petróleo crudo pesado con alto contenido de asfáltenos y, en particular, en petróleo crudo pesado con más del 3.5 por ciento y, más específicamente, más del 4 por ciento de asfáltenos.

ANTECEDENTES

[0002] Cuando un fluido pasa por un conducto necesita superar la fuerza de fricción ejercida por la pared interior del conducto, lo cual produce pérdida de presión. La reducción de resistencia se refiere al fenómeno por el cual se alivia la pérdida de presión mediante la adición de ciertas sustancias químicas llamadas agentes reductores de resistencia o arrastre (DRAs), o mejoradores de flujo. Estas sustancias deben ser compatibles con el flujo tratado o disolverse en él para que puedan reducir la pérdida de fricción. El mecanismo de reducción de resistencia no es totalmente comprendido pero se cree que las largas cadenas de moléculas pueden suprimir las ráfagas turbulentas y por lo tanto reducir la disipación de energía. Se sabe que algunos polímeros como el poli isobutileno son reductores efectivos de presión en aplicaciones de oleoductos, mientras que los polímeros hidrofílicos como la poli acrilamida y el poli óxido de etileno son buenos reductores de presión para el agua.

[0003] Los componentes del petróleo crudo de hidrocarburo pueden ser divididos en cuatro grupos: saturados, aromáticos, resinas y asfáltenos, también conocidos como SARA. Los saturados y aromáticos solo contienen carbón e hidrógeno y por lo tanto poseen escasa o ninguna polaridad. Las resinas y los asfáltenos, en cambio, contienen heteroátomos como azufre, oxígeno e nitrógeno. Ellos representan la porción polar del petróleo crudo.

[0004] Los llamados petróleo crudo liviano y mediano incluyen principalmente saturados y aromáticos, con muy pocas resinas y asfáltenos. Por esta razón, las

polialfaolefinas como el polideceno son excelentes DRAs para esos tipos de crudo. El contenido de resinas y asfáltenos en el crudo pesado, sin embargo, ha llegado al punto de que la polialfaolefina en el DRA, que no es polar, no se puede disolver en él. La inyección de polialfaolefina en el crudo pesado usualmente muestra poca o ninguna reducción de resistencia.

DESCRIPCIÓN DETALLADA

[0005] Aquí se describen agentes reductores de resistencia (DRA o DRAs) y métodos de reducción de resistencia en fluidos hidrocarburos tales como el petróleo crudo pesado con contenido de asfáltenos superior al 3.5 por ciento, en otros enfoques superior al 4 por ciento y aun en otros enfoques superior y cerca del 8 hasta cerca del 15 por ciento, que serán considerados aquí petróleos crudos pesados. Sin querer limitarse por la teoría, para que un DRA surta efecto y/o sea funcional en crudo pesado, un requisito es que el DRA se disuelva en el crudo. En teoría, los polímeros que poseen funcionalidades polares y no polares son candidatos potenciales. La porción polar se encarga de los asfáltenos y las resinas y la porción no polar se ocupa de los saturados y aromáticos en el petróleo crudo. Los descritos aquí son DRAs y métodos únicos para fabricar dichos DRAs que son compatibles con el petróleo crudo pesado según se define aquí.

[0006] En un enfoque, el DRA es una emulsión de polímeros de poliacrilato de alto peso molecular o polímero DRA de polimetacrilato. El polímero puede ser un polímero o co-polímero de 2-etilhexil metacrilato, n-Butil metacrilato y/o isodecil metacrilato. El peso molecular del polímero puede ser mayor que 1 millón y, en algunos enfoques, de entre alrededor de 1 millón hasta alrededor de 5 millones de Daltones. El polímero puede contener entre cerca de 90 y cerca de 99 por ciento de 2-etilhexil metacrilato, en otros enfoques cerca de 95 a cerca de 99 por ciento, y aun en otros enfoques cerca de 97 a cerca de 99 por ciento. Preferiblemente, el polímero tiene cerca de 1 hasta cerca de 5 por ciento de n-Butil metacrilato y en algunos enfoques cerca de 1 a cerca de 2.5 por ciento. Se ha descubierto que dichos polímeros son especialmente capaces de disolverse

y suministrar reducción de resistencia en petróleos crudos pesados como aquellos con alto contenido de asfáltenos descritos atrás, cuando son añadidos al petróleo crudo en un rango de cerca de 1 a cerca de 1000 ppm y/o en una proporción de peso en ppm al contenido de asfáltenos de cerca de 0.33 ppm/peso porcentual de asfáltenos a cerca de 285 ppm/peso porcentual de asfáltenos.

[0007] El DRA puede ser preparado por emulsión y polimerización en un medio disperso de agua o de agua y glicol. Si se emplea, el glicol puede ir de 0 a 50% con base en el producto final.

[0008] El monómero para la polimerización puede ser un acrilato y/o un metacrilato. En un enfoque, el monómero es 2-etilexil metacrilato como un monómero mayor. Para acortar el período de inducción antes de la polimerización, se puede emplear una cantidad menor de un segundo monómero como n-Butil metacrilato (nBMA). El nBMA posee más solubilidad en agua y por lo tanto se usa para facilitar la nucleación en la fase de agua. La mezcla de un monómero mayor y un segundo monómero produce un DRA efectivo para crudos pesados como se describe arriba. El contenido corriente de monómeros apunta aproximadamente del 40% a cerca del 50% por peso del DRA final pero puede oscilar entre cerca del 25% y cerca del 50%.

[0009] El proceso también puede incluir uno o más surfactantes.

[0010] El proceso puede emplear un sistema iniciador y se realiza preferiblemente en frío. Como la polimerización es una reacción exotérmica, realizar las reacciones a baja temperatura ayuda a construir longitud de cadena de polímeros, lo cual afecta directamente el comportamiento del DRA en el oleoducto. En un enfoque, el iniciador puede incluir persulfato de amonio (APS), sulfato ferroso de amonio (Fe^{2+}) y/o hidrosulfito sódico formaldehído (SFS).

[0011] El sistema también puede incluir una solución amortiguadora. Un amortiguador apropiado puede ser un sistema amortiguador de fosfato (sales de fosfato

de potasio y/o sodio, por ejemplo) para controlar el pH a un nivel aproximado a neutral. El amortiguador puede tener cerca del 0.1 por ciento del peso o menos del total.

[0012] El proceso incluye cargar al reactor el iniciador, tal como el hidrosulfito sódico formaldehído. La pre-carga del iniciador, tal como el SFS, puede ser un paso importante para múltiples propósitos: Primero, juega el papel de eliminador de oxígeno, reduciendo el nivel de oxígeno a lo más bajo posible. La presencia de oxígeno impide la iniciación y obstaculiza la formación de un alto peso molecular. Segundo, revierte continuamente el Fe^{3+} hacia el Fe^{2+} , que por lo tanto sigue reaccionando con el oxidante APS. Tercero, el SFS es por sí mismo un agente reductor que reacciona con el APS para producir radicales libres.

[0013] Luego, los monómeros son cargados al reactor. Primero se agrega al reactor el 2-etilhexil metacrilato (2-EHMA) seguido por el n-butyl metacrilato (nBMA). La mezcla se agita entonces para formar una emulsificación.

[0014] Después de un período de tiempo como de cerca de una a dos horas en emulsificación se inyecta el APS y el Fe^{2+} . El APS es una especie controladora que entra al reactor a una tasa más baja que el Fe^{2+} . La generación excesiva de radicales es indeseable y puede conducir a la terminación de cadenas activas, con el resultado de un producto con menor peso molecular.

[0015] El polímero DRA resultante es altamente efectivo para reducir la resistencia en petróleo crudo con alto contenido de asfáltenos tal como el petróleo crudo con cerca del 3.5 por ciento o más de asfáltenos, en otros enfoques con cerca del 4 por ciento o más, y aun en otros enfoques con cerca del 3.5 o cerca del 4 por ciento hasta cerca del 15 por ciento de asfáltenos. Todavía en otros enfoques, el DRA es efectivo para reducir la resistencia en petróleo crudo con cerca del 8 por ciento hasta cerca del 15 por ciento de asfáltenos. Como se emplea aquí, el contenido de asfáltenos es un contenido promedio para el petróleo crudo. En algunos enfoques el petróleo crudo también puede tener una

gravedad API menor de 30, en algunos enfoques menor de 20, y aun en otros enfoques de entre cerca de 10 y cerca de 30.

[0016] Se entenderá que varios cambios en los detalles, materiales y preparativos del DRA y en los métodos para fabricarlos, los cuales han sido descritos aquí e ilustrados para explicar la naturaleza del DRA y la reducción de resistencia descritos aquí, pueden ser hechos por los expertos en la materia en el marco de los principios y el alcance de la descripción y las reivindicaciones expresadas. A menos que se haya expresado aquí de otra manera, todas las partes y porcentajes son por peso.

REIVINDICACIONES

1. Un método de reducción de resistencia en petróleo crudo pesado **caracterizado porque** el petróleo crudo pesado tiene un contenido de asfáltenos de cerca de 3.5 % o mayor, incluye la adición de un polímero de reducción polimérica de resistencia al petróleo crudo pesado y la reducción de resistencia del mismo.

2. El método de la reivindicación 1, **caracterizado porque** el polímero de reducción polimérica de resistencia incluye uno de 2-etilexil metacrilato, n-Butil metacrilato y los métodos para los mismos.

3. El método de la reivindicación 1, **caracterizado porque** el contenido de asfáltenos está entre el 3.5 % y el 15 %.

4. El método de la reivindicación 1, **caracterizado porque** el contenido de asfáltenos está entre el 8 % y el 15 %.

Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Remove

Given Name

Middle Name

Family Name

City

State

Country i

Brian

Lewis

Waller

TX

US

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Title of Invention

DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT

Attorney Docket Number (if applicable)

20486-136762-US

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number

☐ Firm or Individual Name

Customer Number

22242

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the invention was made by an agency of the United States Government. The U.S. Government agency name is:

☐ Yes, the invention was under a contract with an agency of the United States Government. The name of the U.S. Government agency and Government contract number are:

Entity Status

Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29

- ☐ Applicant asserts small entity status under 37 CFR 1.27
- ☐ Applicant certifies micro entity status under 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
- ☒ No

Warning

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Jeff A. Chelstrom/			Date (YYYY-MM-DD)	2015-08-31
First Name	Jeff A.	Last Name	Chelstrom	Registration Number (If appropriate)	57915

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that : (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT

FIELD

[0001] The disclosure relates to drag reduction in heavy crude oil with high asphaltene content and, in particular, heavy crude oil with greater than 3.5 percent and, more particularly, greater than 4 percent asphaltene.

BACKGROUND

[0002] When fluid is moving through a conduit, it needs to overcome the frictional force exerted by the inner wall of the conduit, resulting in pressure loss. Drag reduction is referred to the phenomenon in which the loss of pressure is alleviated by the addition of certain chemical substances called drag reducing agents (DRAs) or flow improvers. Such substances must be compatible with, or dissolve in the treated fluid to be able to reduce its frictional loss. The mechanism of drag reduction is not fully understood, but it is believed that long chain molecules are able to suppress turbulent bursts and thereby reduce energy dissipation. Some polymers such as poly isobutylene and poly alphaolefin are known to be effective drag reducers for oil pipeline applications, while hydrophilic polymers such as poly acrylamide and poly ethylene oxide are good drag reducers for water.

[0003] The constituents in hydrocarbon crude oil can be divided into four groups: saturates, aromatics, resins, and asphaltenes, also known as SARA. Saturates and aromatics contain only carbon and hydrogen, and hence feature little to none polarity. Resins and asphaltenes, on the other hand, contain heteroatoms such as sulfur, oxygen, and nitrogen. They represent the polar portion of the crude oil.

[0004] So called light and medium crude oil includes mostly saturates and aromatics, with very little resins and asphaltenes. For the reason, poly alphaolefin such as polydecene is an excellent DRA for such types of crude. The resin and asphaltene content in heavy crude, however, has reached the point that poly alphaolefin DRA, which is non-polar, cannot dissolve in it. Injection of poly alphaolefin into heavy crude usually shows little or no drag reduction performance.

DETAILED DESCRIPTION

[0005] Described herein are drag reducing agents (DRA or DRAs) and methods of reducing drag in hydrocarbon fluids such as heavy crude oil having an asphaltene content of greater than 3.5 percent, in other approaches, greater than about 4 percent, and in yet other approaches, about 4 to about 15 percent, and in yet other approaches, about 8 to about 15 percent, which will be considered heavy crude oil herein.. Without wishing to be limited by theory, for a DRA to take effect and/or be functional in heavy crude, one requirement is for the DRA to dissolve in the crude. In theory, polymers possessing both polar and non-polar functionalities are potential candidates. The polar portion is to take care of the asphaltenes and resins, while the non-polar part deals with saturates and aromatics in the crude oil. Described herein are unique DRAs and methods of making such DRAs that are compatible with the heavy crude as defined herein.

[0006] In one approach, the DRA is an emulsion polymer of a high molecular weight polyacrylate or a polymethacrylate DRA polymer. The polymer maybe a polymer or copolymer of 2-ethylhexyl methacrylate, n-Butyl methacrylate, and/or isodecyl methacrylate. Molecular weight of the polymer maybe greater than 1 million and, in some approaches, about 1 million to about 5 million Daltons. The polymer may include about 90 to about 99 percent of the 2-ethylhexyl methacrylate and in other approaches about 95 to about 99 percent, and in yet other approaches about 97 to about 99 percent. Preferably, the polymer has about 1 to about 5 percent of the n-Butyl methacrylate and/or isodecyl methacrylate, and in some approaches, about 1 to about 2.5 percent. It has been discovered that such polymers are uniquely able to dissolve and provide drag reduction in heavy crude oils such as those with high asphaltene content described above when added in crude oil from about 1 to about 1000 ppm and/or in a ratio of weight amount in ppm to the asphaltene content of about 0.33 ppm/weight percent asphaltene to about 285 ppm/weight percent asphaltene.

[0007] The DRA may be prepared via emulsion polymerization in a dispersing medium of water or water and glycol. If used, the glycol may range from 0 to 50% based on final product.

[0008] The monomer for the polymerization may be an acrylate and/or a methacrylate. In one approach, the monomer is 2-ethylhexyl methacrylate as a major monomer. To shorten the induction period before the polymerization, a minor amount of a second monomer may be

used, such as n-Butyl methacrylate is added. nBMA has much higher solubility in water and thereby is used to facilitate nucleation in the water phase. Isodecyl methacrylate may also be used. The blend of major monomer and second monomer results in an effective DRA for heavy crudes as described above. Current monomer content targets approximately 40% to about 50% by weight of the final DRA, but can range from about 25 to about 50%.

[0009] The process may also include one or more surfactants.

[0010] The process may use an initiator system and is preferably conducted in a cold process. Since polymerization is an exothermic reaction, conducting reactions at low temperature helps build up polymer chain length, which directly affects DRA performance in the oil pipeline. By one approach, the initiator may include ammonium persulfate (APS), ammonium iron sulphate (Fe^{2+}), and/or sodium formaldehyde sulfoxylate (SFS).

[0011] The system may also include a buffer solution. One suitable buffer may be a phosphate buffer system (potassium and/or sodium phosphate salts, for example) to control pH to around neutral. The buffer may be about 0.1 weight percent or less of the total.

[0012] The process includes charging the initiator, such as sodium formaldehyde sulfoxylate to the reactor. Pre-charging the initiator, such as SFS, may be one important step to serve multiple purposes: First, it plays the role of oxygen scavenger, reducing oxygen level to as low as possible. The presence of oxygen inhibit initiation and prohibit formation of high molecular weight. Second, it continuously reverts Fe^{3+} back to Fe^{2+} which therefore keeps reacting with the oxidizer, APS. Third, SFS itself is a reducing agent, which reacts with APS to produce free radicals.

[0013] Next, the monomers are charged to the reactor. First, 2-ethylhexyl methacrylate (2-EHMA) is added, followed by n-butyl methacrylate (nBMA) into the reactor. The mixture is then agitated to form an emulsification.

[0014] After a period of time, such as about one to about two hours into emulsification begin to co-inject APS and Fe^{2+} . APS is one controlling species which went in the reactor at a much lower rate than Fe^{2+} . Excessive radical generation is undesired and can lead to termination of active chains, resulting in lower molecular weight product.

[0015] The resultant DRA polymer is highly effective to reduce drag in high asphaltene crude oil such as crude oil with about 3.5 percent or higher asphaltene, in other approaches, about 4 percent or higher, and in yet other approaches, about 3.5 or about 4 percent to about 15 percent asphaltene. In yet other approaches, the DRA is effective to reduce drag in crude oil with about 8 percent to about 15 percent asphaltene. As used herein, asphaltene content is an average content for the crude oil. In some approaches, the crude oil may also have an API gravity of less than 30, in some approaches, less than 20, and in other approaches, about 10 to about 30.

[0016] It will be understood that various changes in the details, materials, and arrangements of the DRA and methods of making thereof, which have been herein described and illustrated in order to explain the nature of the DRA and drag reduction described herein, may be made by those skilled in the art within the principle and scope of the embodied description and claims. Unless otherwise stated herein, all parts and percentages are by weight.

CLAIMS

What is claimed is:

1. A method of drag reduction in heavy crude oil having asphaltene content of greater than about 3.5 weight percent including adding a polymeric drag reducing polymer to the heavy crude oil and reducing drag thereof.
2. The method of claim 1, wherein the polymeric drag reducing polymer includes one of 2-ethylhexyl methacrylate, n-Butyl methacrylate, isodecyl methacrylate and methods thereof.
3. The method of claim 1, wherein the asphaltene content is about 3.5 to about 15 percent.
4. The method of claim 1, wherein the asphaltene content is about 8 to about 15 percent.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20486-136762-US
		Application Number	
Title of Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Brian		Lewis			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Waller	State/Province	TX	Country of Residence i	US	
Mailing Address of Inventor:						
Address 1		20333 Blinka Road				
Address 2						
City	Waller	State/Province	TX			
Postal Code	77484	Country i	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	22242		
Email Address	JACHel@fitcheven.com	Add Email	Remove Email

Application Information:

Title of the Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		
Attorney Docket Number	20486-136762-US	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	
Filing By Reference :			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20486-136762-US
		Application Number	
Title of Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	22242		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20486-136762-US
		Application Number	
Title of Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove Access Code ^j (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices
--

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20486-136762-US
		Application Number	
Title of Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Applicant 1				Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☐ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor		
☐ Person to whom the inventor is obligated to assign.	☐ Person who shows sufficient proprietary interest			
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor :				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20486-136762-US
		Application Number	
Title of Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		

Mailing Address Information For Applicant:			
Address 1			
Address 2			
City		State/Province	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20486-136762-US
		Application Number	
Title of Invention	DRAG REDUCTION FOR HEAVY CRUDE OIL WITH HIGH ASPHALTENE CONTENT		

Signature:

Remove

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature	/Jeff A. Chelstrom/		Date (YYYY-MM-DD)	2015-08-31	
First Name	Jeff A.	Last Name	Chelstrom	Registration Number	57915

Additional Signature may be generated within this form by selecting the Add button.

Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	Drag Reduction for Heavy Crude with High Asphaltene Content			
First Named Inventor/Applicant Name:	Brian Lewis			
Filer:	Jeffrey Alan Chelstrom.			
Attorney Docket Number:	20486-136762			
Filed as Large Entity				
Filing Fees for Provisional				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional Application Filing	1005	1	260	260
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				260

Electronic Acknowledgement Receipt

EFS ID:	23364530
Application Number:	62212584
International Application Number:	
Confirmation Number:	7556
Title of Invention:	Drag Reduction for Heavy Crude with High Asphaltene Content
First Named Inventor/Applicant Name:	Brian Lewis
Customer Number:	22242
Filer:	Jeffrey Alan Chelstrom.
Filer Authorized By:	
Attorney Docket Number:	20486-136762
Receipt Date:	31-AUG-2015
Filing Date:	
Time Stamp:	23:49:08
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$ 260
RAM confirmation Number	7441
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	Provisional_Cover_Sheet136762.pdf	1477303	no	3
			bdd5d0c45603646bc801069cdd48bf1de03f097b		
Warnings:					
Information:					
2	Specification	Patent_Application_Specificaton.pdf	69806	no	5
			4331d7ca53b36012541572d166002e4d7fb7b7cae		
Warnings:					
Information:					
3	Application Data Sheet	ADS136762.pdf	1818691	no	7
			84790387a65b6b187b75494e02de869a8b1460b1		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29719	no	2
			6411c0b2739a737456cff4b16311bfd7fd9932bf		
Warnings:					
Information:					
Total Files Size (in bytes):			3395519		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

DELEGATURA PARA LA PROPIEDAD INDUSTRIAL
FORMULARIO PARA OTORGAR PODER A ABOGADO
EN LOS TRÁMITES DE PROPIEDAD INDUSTRIAL

1. Datos del otorgante

☒

Persona Natural

☐

Persona Jurídica

BRIAN LEWIS

Nombre o denominación /Razón Social completa (En caso de que haya más de un solicitante, relaciónese en hoja adjunta)

Nombre del representante

Tipo de empresa

☐

Micro

☐

Pequeña

☐

Mediana

Otra

☐

Documento de identificación:

C.C.

C.E.

NIT

☒

Otro Número

428815992

Nacionalidad/País de constitución	Dirección del otorgante	
Estados Unidos	20333 Blinka Road, Waller, 77484, TX, US	
Dirección electrónica	No. Fax	Número telefónico
blewis@flowchem-dra.com	936-372-0058	936-372-5347

2. Datos del apoderado:

Ernesto Rengifo García

cc. 14.232.210

No. 49467 CSJ

Apellidos y Nombre

Documento de identificación

Tarjeta profesional

Nacionalidad/País de constitución	Dirección del otorgante	
Colombia	Calle 70 No. 4-36 Bogotá, Colombia	
Dirección electrónica	No. Fax	Número telefónico
erengifo@rengifoabogados.com		6540888 - 2118014

Mediante el presente documento, la persona indicada en el punto 1 de este documento nombra a la persona que se identifica en el punto 2 como apoderado para las actuaciones que se relacionan a continuación:

3. Actuaciones en cuestión:

Este poder concierne:

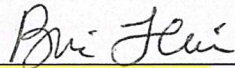
- ☐ Todas las solicitudes y/o registros actuales y futuros del otorgante.
- ☒ La(s) siguiente(s) solicitud(es) y/o registro(s):

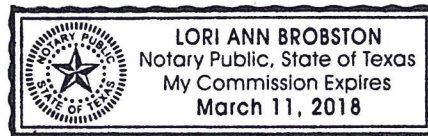
NOMBRE	NÚMERO DE SOLICITUD O REGISTRO
PATENTE DE INVENCION	REDUCCION DE ARRASTRE O FRICCION EN PETROLEO CRUDO PESADO CON ALTO CONTENIDO DE ASFALTENOS

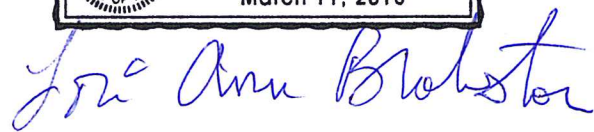
NOTA: Si el espacio anterior no es suficiente, por favor relacione las actuaciones en hoja anexa.

4. Alcance del poder:

- ☒ Confiero expresamente al apoderado todas las facultades legales para que represente mi(s) interés(es) en la(s) actuación(es) señalada(s) en el punto 3 de este documento, incluyendo:
- ☒ Desistir de la(s) solicitud(es) y de las demás actuaciones
 - ☒ Renunciar a los derechos del registro de signos distintivos o de nuevas creaciones
 - ☒ Transigir
 - ☒ Recibir
 - ☒ Conciliar

5. Firma	
BRIAN LEWIS	
Nombre del Firmante	Firma (SIGNATURE)
ID. 428815992	





RESUMEN

La presente invención se refiere a un método de reducción de resistencia en petróleo crudo pesado con alto contenido de asfáltenos y, en particular, en petróleo crudo pesado con más del 3.5 por ciento y, más específicamente, más del 4 por ciento de asfáltenos, el método incluye la adición de un polímero de reducción polimérica de resistencia al petróleo crudo pesado y la reducción de resistencia del mismo.