

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO	
RAD: 15-23425- -1	FECHA: 2016-05-12 16:24:42
DEP: 2020 DIRECCION DE NUEVAS CREACIONES	EVE: 378 FASE NACIONAL INCLUIDO CAPITULO I
TRA: 11 PCT-PATENTE DE INVENCION CAPITULOS I Y II	FOLIOS: 9
ACT: 519 TRASLADOINFORME	

DIRECCIÓN DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogado(a)/Señor(a)
SILVANA MARÍA LÓPEZ DÍAZ

Asunto: Radicación: 15-23425- -1
Trámite: 11
Evento: 378
Actuación: 519
Oficio: 5636
Folios: 9

Patente de Invención	X			Patente de Modelo de Utilidad	
Vía Nacional					
Vía PCT (Fase Nacional)	X	Capítulo I	X	Capítulo II	
No. Solicitud Internacional	PCT/US2012/034801				
Fecha de Presentación Internacional	24/04/2012				

Como resultado del examen de fondo realizado, con fundamento en el Artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se comunica:

1. Documentos estudiados

Descripción:	Rad. N° 15-023425-00000-0000	05/febrero/2015
Reivindicaciones:	Rad. N° 15-023425-00000-0000	05/febrero/2015
Dibujos:	Rad. N° 15-023425-00000-0000	05/febrero/2015
Prioridad:	US 61/478.768	25/abril/2011
	US 61/479.187	26/abril/2011
	US 61/597.371	10/febrero/2012

2. Análisis de la Prioridad

Se acepta la reivindicación de prioridad porque ésta solicitud fue presentada dentro del plazo establecido (Art. 9 D 486) y su contenido técnico corresponde con el de la prioridad reivindicada.

3. Presentación de solicitud Fraccionaria (Art 36 D 486)

La solicitud N° 15-023425 se presenta como una divisional de la solicitud parental N° 13-252769, de tal manera, se beneficia de la fecha de presentación y de la prioridad invocada en ella.

De igual manera, se acepta para examen porque no implica ampliación de la materia contenida en la solicitud inicial.

4. Objeto de la invención

De acuerdo con lo establecido en el numeral 1.2.2.2 del Capítulo Primero del Título X de la Circular Única para efectos del examen de patentabilidad, se tendrá en cuenta la tasa pagada por el solicitante al momento de comenzar el examen para las reivindicaciones adicionales; esto es que cuando la solicitud contenga más de diez (10) reivindicaciones y no se haya pagado la tasa complementaria, sólo se estudiarán las cubiertas por la tasa pagada. En el presente caso se estudiarán las reivindicaciones 1 a 11 del capítulo reivindicatorio (Pág. 80 a 83, Radicado N°15-023425-00000-0000).

Título de la solicitud: "Sistemas y métodos de separación osmótica" (Pág. 1, Radicado N°15-023425-00000-0000).

El problema planteado en esta solicitud consiste en la necesidad de proporcionar, un método de osmosis directa donde se reduzca el fenómeno de intercambio iónico, lo cual altera el equilibrio de iones en el sistema y se traduce en una mayor dificultad para recuperar solutos de extracción.

Para resolver este problema técnico, la solicitud en estudio proporciona métodos y sistemas de membrana impulsados osmóticamente, incluyendo separación por osmosis directa (FO), concentración osmótica directa (DOC), osmosis directa asistida por presión y osmosis retardada por presión (PRO).

El objeto de la presente solicitud se relaciona con la Clasificación Internacional de Patentes (CIP): B01D 61/00, B01D 61/02, B01D 61/58 AC, B01D 65/08.

5. De la solicitud de patente

Reivindicaciones (Art 30 D 486, Art 22 PCT)

- El procedimiento de las reivindicaciones 1 y 4 no se encuentra correctamente definido, por cuanto su preámbulo indica Método/Proceso, sin embargo, muestran la secuencia de etapas técnicas de manera general, sin reivindicar las condiciones técnicas (temperaturas, flujos, presiones, etc.), con las cuales debe llevarse a cabo la invención, por lo anterior estas reivindicaciones no son claras. Se sugiere realizar las aclaraciones respectivas o definir la invención por sus características esenciales y estructurales, teniendo en cuenta no modificar o ampliar la materia ya divulgada.
- En las reivindicaciones se presentan como características técnicas esenciales términos generales, tales como: de la reivindicación 1 "que tiene una alta demanda bioquímica de oxígeno o un alta demanda química de oxígeno", "un primer costado", "membrana semipermeable", "relación molar mayor de uno a uno", "segundo costado", "una porción del agua residual", "una porción de la solución de extracción diluida", "una operación de separación", de la reivindicación 2 "la segunda solución", "un proceso secundario", de la reivindicación 4 "una primera solución", "un solvente", "un soluto", "un primer costado", "semillas", "una solución de extracción", "un segundo costado", "una unidad de separación", de la reivindicación 5 "los solutos de extracción", "solución de extracción", de la reivindicación 6 "solute precipitado", de la reivindicación 7 "procesar al menos uno de los solutos o la primera solución", de la reivindicación 8 "la primera solución", "solvente", "un soluto", "medios para introducir", "semillas" de la reivindicación 9 "módulo de separación", de la reivindicación 10 "medios para reciclar", "solutos de extracción" "solución de extracción" de la reivindicación 11 "módulo de recuperación". Los cuales sugieren de forma imprecisa que la protección se extiende a otras posibles variaciones o

modificaciones y no restringen la invención, se sugiere realizar las modificaciones respectivas utilizando términos que describan de forma más específica la invención.

- En las reivindicaciones los términos *“concentrada”* (Reiv. 1, 4, 5, 8 y 10), *“mayor”* (Reiv. 1), *“al menos”* (Reiv. 1, 2, 4, 6 a 9), *“una pluralidad”* (Reiv. 4 y 8) son imprecisos y/o relativos, por lo cual no permiten distinguir la invención del estado de la técnica. Se sugiere eliminarlos o sustituirlos por términos precisos o rangos concretos.
- En la reivindicaciones las expresiones *“para mantener un gradiente de concentración osmótico deseado a través de la membrana semipermeable”* (Reiv. 1), *“para mantener una relación molar deseada en la solución de extracción concentrada”* (Reiv. 5), *“para recibir la primera solución que comprende un solvente y al menos un soluto”* y *“para recibir la solución de extracción concentrada”*, (Reiv. 8) *“para recibir al menos una corriente de solvente o solutos de extracción”* (Reiv. 9), *“para recuperar los solutos precipitados”* (Reiv. 11), corresponden a características funcionales, las cuales aunque explican la relación que hay entre diversas características estructurales y pueden estar incluidas en las reivindicaciones, no definen la invención; de tal manera no se tiene en cuenta para el estudio de patentabilidad.
- Las reivindicaciones hacen referencia a resultados a obtener o efectos como lo son: de la reivindicación 1 *“para formar una segunda solución en el primer costado de la membrana semipermeable y una solución de extracción diluida en el segundo costado de la membrana semipermeable”* y *“para recuperar los solutos de extracción y una corriente de solvente”*, de la reivindicación 4 *“para formar una segunda solución en el primer costado de la membrana semipermeable y una solución de extracción diluida en el segundo costado de la membrana semipermeable”* y *“para recuperar al menos una corriente de solvente o solutos de extracción”*, *“fomentar la nucleación de al menos un soluto en la primera solución”*, de la reivindicación 8 *“causan nucleación de al menos una porción de al menos un soluto en la primera solución en la cámara”*, lo cual no es permitido para caracterizar la invención, ya que incluiría no sólo la solución propuesta por el solicitante sino todas las alternativas presentes o futuras que lleguen a ese resultado. Se sugiere reemplazarlo por las características esenciales que contribuyen a la obtención de ese efecto.
- Las expresiones *“fomentar”*, *“direccionar”* y *“procesar”* de las reivindicaciones 1, 4 y 7 no son claras para describir las etapas del método reclamado, por lo que se sugiere corregir estos términos, por términos más específicos y concretos, los cuales describan la invención de manera menos general.
- La redacción de la expresión *“en una relación molar mayor de uno a uno”*, de la reivindicación 1, no es clara y por lo tanto no permite definir la característica que se desea proteger.
- La estructura de la reivindicación 8, tiene más de un enlace gramatical al referir *“que comprende”*, lo cual no permite distinguir claramente el objeto que busca proteger.
- Se le sugiere al solicitante que coloque al frente de la característica o del elemento, el número de referencia de las gráficas o dibujos, guardando correspondencia con el capítulo descriptivo y dicho capítulo reivindicatorio, con el objetivo de comprender mejor la invención al momento de hacer el análisis y distinguir los elementos de dicha invención.

6. Determinación del Estado de la Técnica

El estado de la técnica se determinó con base en la fecha de presentación de la

solicitud de prioridad: 25 de abril de 2011, y se encontraron los siguientes documentos que anticipan el objeto de esta solicitud:

Ítem	Documento	Título	Fecha de Publicación
D1	WO 2009/155596	“Forward osmosis separation process”	23/diciembre/2009
D2	WO 2005/012185	“Solvent removal process”	10/febrero/2005

El documento D1¹ divulga un proceso de separación usando ingeniería de ósmosis que implica la extracción de un disolvente de una primera solución para concentrar el soluto mediante el uso de una segunda solución concentrada para extraer el disolvente de la primera solución a través de una membrana semi-permeable (Resumen).

El documento D2² divulga un proceso para retirar un solvente de una primera solución, dicho proceso comprende ubicar una membrana selectiva entre una primera y una segunda solución, donde esta última tiene un potencial osmótico mayor que la primera solución, de tal manera que el disolvente de la primera solución pasa a través de la membrana para diluir la segunda solución, y la extracción del disolvente de la segunda solución, en la que la membrana tiene un tamaño de poro promedio de al menos 10 Angstroms, y en el que la segunda solución contiene especies de soluto que son demasiado grandes para pasar a través de los poros de la membrana (Resumen).

7. Examen de Patentabilidad (Art 14 D486)

Novedad (Art16 D486)

La reivindicación 1 consiste en: *“Un método para tratar agua residual, que comprende...”* (Ver pág. 80 Rad. N° 15-023425-00000-0000).

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Características Esenciales	D1
Un método para tratar agua residual, que comprende las etapas de:	Un proceso de osmosis para tratamiento de residuos que comprende (Reivindicación 14).
Introducir agua residual que tiene una alta demanda bioquímica de oxígeno o una alta demanda química de oxígeno en un primer costado de la membrana semipermeable.	Introducción de una primera solución que comprende una especie de disolvente o de al menos un objetivo en un primer lado de una membrana semi-permeable (Reivindicación 14). En el que la primera solución comprende de aguas residuales (Reivindicación 15). La primera solución comprende sales, materia orgánica, coloides suspendidos u organismos biológicos (Reivindicación 16).
Introducir una solución de extracción concentrada que comprende amoníaco y dióxido de carbono en una relación molar mayor de uno a uno en un segundo costado de la membrana semipermeable.	La introducción de una segunda solución que comprende amoníaco y dióxido de carbono en una relación molar de al menos 1: 1 en un segundo lado de la membrana semi-permeable, formando de esta manera un gradiente de concentración osmótica a través de la membrana semi-permeable (Reivindicación 14).
Fomentar un flujo de al menos una porción del agua residual a través de la membrana semipermeable.	Promover el flujo de al menos una porción del disolvente de la primera solución a través de la membrana semi-permeable para formar una segunda solución en el primer lado de la membrana semipermeable y una solución diluida de extracción (Reivindicación 14).
Introducir al menos una porción de la solución de	Introducir al menos una porción de la solución

1 <http://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=2009155596A2&KC=A2&FT=D>

2 http://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=2005012185A1&KC=A1&FT=D&ND=&date=20050210&DB=&locale=en_EP

extracción diluida a una operación de separación.	diluida de drenaje a una operación de separación para generar con ello solutos y una corriente de disolvente (Reivindicación 14).
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De acuerdo con la tabla anterior, las características esenciales del método de la reivindicación 1 habían sido divulgadas previamente en el documento D1, por lo tanto, la materia reivindicada no es nueva.

Asimismo, el documento D1 divulga las características de las reivindicaciones dependientes así:

Reivindicación 2: La segunda solución de disolvente enriquecido restante puede ser transferido desde la cámara de filtro (29) a una cuarta cámara (24), como se muestra por la flecha (23), donde se calienta a continuación, para descomponer los solutos en sus gases constituyentes (Pág. 14, líneas 8 a 10).

Reivindicación 3: El proceso puede incluir además una etapa de suministro de calor residual para la operación de separación (Pág. 3, líneas 18 y 19).

Nivel Inventivo (Art 18 D486)

La reivindicación 4 consiste en: *“Un proceso de osmosis directa que comprende...”* (Ver pág. 81 Rad. N° 15-023425-00000-0000).

Características Esenciales	D1	D2
Un proceso de osmosis directa que comprende las etapas de	Un proceso de osmosis para tratamiento de residuos que comprende (Reivindicación 14).	Un procedimiento para eliminar un disolvente de una primera solución (Reivindicación 1).
Introducir una primera solución que comprende un solvente y la menos un soluto en un primer costado de la membrana semipermeable.	introducción de una primera solución que comprende una especie de disolvente o de al menos un objetivo en un primer lado de una membrana semi-permeable (Reivindicación 14)	la colocación de una membrana selectiva entre la primera solución y una segunda solución que tiene un potencial osmótico mayor que la primera solución (Reivindicación 1)
Introducir una pluralidad de semillas a la primera solución.	No lo menciona	No lo menciona
Introducir una solución de extracción concentrada a un segundo costado de la membrana semipermeable.	La introducción de una segunda solución que comprende amoníaco y dióxido de carbono en una relación molar de al menos 1: 1 en un segundo lado de la membrana semi-permeable, formando de esta manera un gradiente de concentración osmótica a través de la membrana semi-permeable (Reivindicación 14).	La colocación de una membrana selectiva entre la primera solución y una segunda solución que tiene un potencial osmótico mayor que la primera solución (Reivindicación 1)
Fomentar la nucleación de al menos un soluto en la primera solución.	No lo menciona	No lo menciona
Fomentar un flujo de al menos una porción de solvente a través de la membrana semipermeable.	Promover el flujo de al menos una porción del disolvente de la primera solución a través de la membrana semi-permeable para formar una segunda solución en el primer lado de la membrana semipermeable y una solución diluida de extracción (Reivindicación 14).	El disolvente de la primera solución pasa a través de la membrana para diluir la segunda solución (Reivindicación 1).

Direccionar al menos una porción de la solución extraída diluida a una unidad de separación.	Introducir al menos una porción de la solución diluida de drenaje a una operación de separación para generar con ello solutos y una corriente de disolvente (Reivindicación 14).	El disolvente se extrae de la segunda solución por una membrana y / o un método de separación térmica (Reivindicación 2).
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El documento D1 se considera el estado de la técnica más cercano a la invención definida en la reivindicación 4 porque divulga un proceso de separación usando ingeniería de ósmosis que implica la extracción de un disolvente de una primera solución para concentrar el soluto mediante el uso de una segunda solución concentrada para extraer el disolvente de la primera solución a través de una membrana semi-permeable (Resumen).

La diferencia entre la invención, definida en la reivindicación 4 y el proceso divulgado de D1 consiste en que este último no menciona las etapas de introducir semillas a la primera solución, ni la de fomentar la nucleación de al menos un soluto en la primera solución.

El efecto que logra el incluir semillas a la primera solución es que permite la nucleación de los solutos, mejorando así la separación de los componentes presentes en la misma, haciendo más eficiente el proceso de separación.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “¿Cómo modificar el método conocido en D1, con el fin de conseguir un proceso de separación más eficiente?”.

Sin embargo una persona normalmente versada en la material conoce que dentro de las operaciones de separación se encuentra la cristalización que es un proceso que tiene lugar en dos etapas: La primera de ellas consiste en la formación del cristal y recibe el nombre de nucleación, la segunda corresponde al crecimiento del cristal, en donde el potencial impulsor de ambas etapas es la sobresaturación, por tanto las condiciones técnicas como la temperatura, las concentraciones, los compuestos, son importantes en dichas etapas (“Teoría de la cristalización, Sobresaturación”). Si bien es cierto que el documento D2 no divulga específicamente las etapas de introducir semillas a la primera solución ni la de fomentar la nucleación de al menos un soluto en la misma, sí enseña que el disolvente también puede ser recuperado de la segunda solución mediante la introducción de microorganismos para convertir los solutos disueltos en productos insolubles (es decir, bio-desalación) y que estos productos insolubles se pueden separar del disolvente, por ejemplo, por filtración, y que una combinación de técnicas puede usarse para extraer el disolvente de la segunda solución, por ejemplo se puede emplear la cristalización, destilación, nano filtración y osmosis inversa (Pág. 11, línea 19 hasta Pág. 12, línea 7).

En consecuencia, la persona del oficio normalmente versada en la materia, partiendo de sus conocimientos previos y de las enseñanzas del documento D2, estaría motivada a introducir semillas a la primera solución y fomentar la nucleación de al menos un soluto en la primera solución, en el procedimiento divulgado en el documento D1 para llegar así al objeto de la reivindicación 1 de la solicitud. Por lo cual se considera obvia.

Asimismo, el documento D1 divulga las características de las reivindicaciones dependientes así:

Reivindicación 5: Retornar los solutos de extracción a la segunda cara de la membrana semipermeable (Reivindicación 1).

Reivindicación 6: La descarga (14), es decir, la primera solución concentrada tiene una mayor concentración de solutos. Por lo tanto, el exceso de solutos puede ser retirado de la primera solución concentrada antes de devolver la primera solución a su fuente o

recircular la primera solución a través del presente método. Esto se puede hacer, por ejemplo, en algunas realizaciones no limitantes, poniendo en contacto la primera solución concentrada con un evaporador solar, un mecanismo de filtración simple pantalla, hidrociclón, o una masa precipitación u otro punto de nucleación, para precipitar el soluto (Pág. 12, línea 31 a Pág. 13, línea 5).

Reivindicación 7: La introducción de la al menos una especie objetivo recuperados a una unidad de tratamiento adicional (Reivindicación 12).

Por su parte, la reivindicación 8 consiste en *“Un sistema para el tratamiento de una solución empleando osmosis, que comprende...”* (Ver pág. 82 Rad. N° 15-023425-00000-0000).

Características Esenciales	D1
Un sistema para el tratamiento de una solución empleando osmosis, que comprende:	Muestra un diagrama general de un método de separación osmótica hacia adelante de acuerdo con una o más realizaciones (Pág. 8, líneas 12 a 13)
Una cámara configurada para recibir la primera solución que comprende un solvente y al menos un soluto	Una solución (10), por ejemplo, agua de mar, agua salobre, aguas residuales, agua contaminada u otra solución, que se refiere como la primera solución, está dispuesto en una primera cámara (12). La primera cámara (12) está en comunicación de fluido con una membrana semi-permeable (16) como se ilustra por la flecha (13) (Pág. 8, líneas 14 a 17).
Un módulo de membranas ubicado dentro de la cámara y comprende una membrana semipermeable que tiene una superficie exterior que está en comunicación fluida con la primera solución y una superficie interna para recibir la solución de extracción concentrada	La membrana semi-permeable (16) (Pág. 8, línea 17).
Medios para introducir una pluralidad de semillas en una cámara	No lo menciona.

El documento D1 se considera el estado de la técnica más cercano a la invención definida en la reivindicación 8 porque divulga proceso de separación y un aparando usando ingeniería de ósmosis que implica la extracción de un disolvente de una primera solución para concentrar el soluto mediante el uso de una segunda solución concentrada para extraer el disolvente de la primera solución a través de una membrana semi-permeable (Resumen).

La diferencia entre la invención, definida en la reivindicación 8 y el sistema de D1, consiste en que este no hace referencia a los medios para introducir semillas a la primera cámara.

No se evidencia un efecto técnico inesperado entre el sistema de la presente solicitud que plantea implementar una entrada para semillas a la primera cámara y el sistema divulgado en el documento D1, dado que dichos documentos solucionan el mismo problema técnico, que consiste en proporcionar un sistema donde se reduzca el fenómeno de intercambio iónico.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: *“¿Cómo obtener un sistema para el tratamiento de soluciones por ósmosis, alternativo al revelado en el documento D1?”*.

Sin embargo una persona medianamente versada en la materia conoce que dentro de los sistemas de tratamiento de soluciones empleando osmosis se pueden incluir medios para introducir una pluralidad de semillas en una cámara, y estaría en capacidad de implementar una entrada de sustancias que eliminan contaminantes

químicos y/o biológicos de la corriente a tratar, en el sistema reclamado tal como en la primera cámara, donde dichos procesos biológicos que se emplean en el tratamiento de aguas residuales, tienen su origen en procesos y fenómenos que se producen en la naturaleza, que el proceso de tratamiento biológico consiste en el control del medio ambiente de los microorganismos de modo que consigan condiciones de crecimiento óptimas; y que las principales aplicaciones de estos procesos son: la eliminación de la materia orgánica carbonosa, la nitrificación, la denitrificación, la eliminación de fósforo y la estabilización de fangos (“Procesos biológicos aplicados al tratamiento de agua residual”, Introducción, Pág. 52)³. Cabe mencionar que, la solución al anterior problema técnico objetivo se encuentra dentro de un proceso de optimización, lo cual hace parte de la práctica habitual de la persona versada en la materia que trabaja en tratamiento de aguas y/o en procesos de separación de soluciones. Por otra parte, el documento D1 divulga que la primera solución puede ser filtrada y pretratada de acuerdo con técnicas conocidas con el fin de eliminar los desechos sólidos y contaminantes químicos, biológicos, y así evitar el ensuciamiento de la membrana, antes de la separación osmótica (Pág. 9, líneas 18 a 20).

En consecuencia, la persona del oficio normalmente versada en la materia, partiendo de sus conocimientos previos, estaría motivada a implementar una entrada para semillas a la primera cámara en el procedimiento divulgado en el documento D1 para llegar así al objeto de la reivindicación 8 de la solicitud. Por lo cual se considera obvia.

Asimismo, el documento D1 divulga las características de las reivindicaciones dependientes así:

Reivindicación 9: Una segunda solución que tiene una concentración mayor que la primera solución está contenida en la segunda cámara (18). La solución de concentración más alta permite que el disolvente, es decir, el agua, de la primera solución en la primera cámara (12) para ósmosis a través de la membrana semi-permeable (16) en la segunda solución más concentrada situado dentro de la segunda cámara (18) como se ilustra por la flecha (15) (Pág. 8, líneas 18 a 22).

Reivindicaciones 10 y 11: El soluto precipitado descartado de una cámara de filtración puede ser reciclado a la segunda cámara (18) en los que puede disolverse en la segunda solución y de ese modo mantener la alta concentración de la segunda solución, como se muestra por la flecha (28). Además, los gases constituyentes retirados de la segunda solución de disolvente enriquecido en la cuarta cámara (24) se pueden reciclar de nuevo a la segunda o tercera cámaras (18, 22) como se muestra por las flechas (20) y (30), respectivamente, donde actúan como reactivos (Pág. 15, líneas 12 a 17).

8. Conclusión

Los requisitos de Patentabilidad de la presente solicitud están afectados así:

Ítem	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	WO 2009/155596	1 a 3	Novedad/Nivel Inventivo
		4 a 11	Nivel Inventivo
D2	WO 2005/012185	4	Nivel Inventivo

³ Procesos biológicos aplicados al tratamiento de agua residual. Elida Nodal Becerra. Ingeniería hidráulica y ambiental, Vol. XXII, N° 4, 2001.
<http://www.bvsde.paho.org/bvsaar/fulltext/residuales.pdfco>

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta (60) días contados a partir de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Si como respuesta a este requerimiento el solicitante llegara a modificar: i) el capítulo reivindicatorio, ii) la descripción de la invención a proteger, iii) o presente un nuevo capítulo reivindicatorio, y desee que se realice un nuevo examen de patentabilidad a esta modificación, no deberá pagar la tasa de modificación voluntaria pero sí la correspondiente a la tasa de examen de patentabilidad. En todo caso, el número de requerimientos por no patentabilidad estará supeditado a que el término del estudio de patentabilidad no sea superior a 18 meses, contados desde la publicación de la solicitud de patente de invención. Adicionalmente, se le recuerda al solicitante que si como respuesta a este requerimiento llegara a modificar el capítulo reivindicatorio y éste contenga más de diez (10) reivindicaciones deberá pagar la tasa por reivindicación adicional.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única No. 10 de 2001.



JOSÉ LUIS SALAZAR LÓPEZ
Director de Nuevas Creaciones (c)

El anterior requerimiento fue notificado por fijación en lista, de fecha 2016-05-17

Elaboró: Nelcy Lorena Montes Vanegas

Revisó: Alba Rocio Lemus Quiroga

Nelcy

Search history

Search 1: PN=(WO2012/148911) (Results 1)

Search 2: [SP]: 1. a method of maximizing draw solute recovery in an osmotically driven membrane system, the method comprising the steps of: providing a first osmotically driven membrane system comprising a forward osmosis membrane and configured for receiving a first solution on a first side of the membrane and a concentrated draw solution on a second side of the membrane osmotically separating a solvent from the first solution using the concentrated draw solution, thereby forming a second solution on the first side of the membrane and a dilute draw solution on the second side of the membrane, wherein the second solution comprises at least one first ionic species of solute via reverse ion exchange through the membrane separating the dilute draw solution to recover at least one draw solute and the solvent, wherein the recovered solvent comprises at least one second ionic species of solute recycling the recovered at least one draw solute to the first osmotically driven membrane system providing a second osmotically driven membrane system comprising a reverse osmosis membrane pressurizing the recovered solvent in the second osmotically driven membrane system to recover a substantially pure solvent and a concentrated solution comprising the at least one second ionic species of solute recycling the concentrated solution comprising the at least one second ionic species of solute to the first osmotically driven membrane system, wherein the concentrated solution is added to the first solution, thereby resulting in the second solution comprising the at least one first ionic species of solute and the at least one second ionic species of solute balancing the at least one first species of solute with the at least one second species of solute to form additional removable draw solutes and separating the second solution to recover the additional draw solutes and a third solution. 2. the method of claim 1 further comprising the step of recycling the additional draw solutes into the concentrated draw solution. 3. the method of claim 1, wherein the step of separating the dilute draw solution comprises distillation. 4. the method of claim 1, wherein the concentrated draw solution comprises ammonia and carbon dioxide in a molar ratio of at least 1:1. 5. a system for osmotic extraction of a solvent from a first solution, comprising: a forward osmosis system comprising: a first chamber having an inlet fluidly connected to a source of the first solution a second chamber having an inlet fluidly connected to a source of a concentrated draw solution and a semi-permeable membrane system separating the first chamber from the second chamber a first separation system fluidly coupled to the forward osmosis system downstream of the second chamber and configured to receive a dilute draw solution therefrom and to separate the dilute draw solution into draw solutes and a solvent stream a pressure exchanger fluidly coupled to the separation system and configured to pressurize and transport the solvent stream a reverse osmosis system fluidly coupled to the pressure exchanger and comprising: a first chamber configured for receiving the pressurized solvent stream a semi-permeable membrane coupled to the first chamber and a second chamber coupled to the semi-permeable membrane and configured for receiving a solvent fluxed through the membrane, wherein the first chamber of the reverse osmosis unit is fluidly coupled to the first chamber of the forward osmosis unit to provide at least a portion of the first solution and a second separation system fluidly coupled to the first chamber of the forward osmosis system and configured for receiving a concentrated first solution therefrom and removing at least one of draw solutes and a product stream from the concentrated first solution. 6. the system of claim 5 further comprising a recycling system in fluid communication with the second separation system for returning the separated draw solutes to the concentrated draw solution. 7. the system of claim 5, wherein the concentrated draw solution comprises ammonia and carbon dioxide in a molar ratio of at least one to one. 8. the system of claim 5, wherein at least one of the first and second separation systems comprises at least one of a distillation column or a contact membrane. 9. a method of treating wastewater, comprising: introducing wastewater having a high biochemical oxygen demand or a high chemical oxygen demand on a first side of a semi-permeable membrane introducing a concentrated draw solution comprising ammonia and carbon dioxide at a molar ratio of at least one to one on a second side of the semi-permeable membrane to maintain a desired osmotic concentration gradient across the semi-permeable membrane promoting flow of at least a portion of the wastewater across the semi-permeable membrane to form a second solution on the first side of the semi-permeable membrane and a dilute draw solution on the second side of the semi-permeable membrane and introducing at least a portion of the dilute draw solution to a separation operation to recover draw solutes and a solvent stream. 10. the method of claim 9, further comprising introducing the second solution to a secondary process including at least one of an incinerator and an anaerobic digester. 11. the method of claim 10, further comprising providing heat generated during the secondary process to the separation operation. 12. a forward osmosis process comprising the steps of: introducing a first solution comprising a solvent and at least one solute on a first side of a semi-permeable membrane introducing a plurality of seeds to the first solution introducing a concentrated draw solution to a second side of the semi-permeable membrane promoting nucleation of the at least one solute in the first solution and promoting a flow of at least a portion of the solvent across the semi-permeable membrane to form a second solution on the first side of the semi-permeable membrane and a dilute draw solution on the second side of the semi-permeable membrane. 13. the process of claim 12, further comprising the step of directing at least a portion of the dilute draw solution to a separation unit to recover at least one of a solvent stream or draw solutes. 14. the process of claim 13, further comprising the step of reintroducing draw solutes into the concentrated draw solution on the second side of the semi-permeable membrane to maintain a desired molar ratio in the concentrated draw solution. 15. the process of claim 12 further comprising the step of recovering at least a portion of the at least one solute precipitated out of the first solution. 16. the process of claim 15, wherein the step of recovering the precipitated solutes comprises further processing of at least one of the solute or the first solution. 17. a system for the processing of a solution using osmosis, the system comprising: a forward osmosis module comprising: a first chamber in fluid communication with a source of a first solution comprising a solvent and at least one solute a second chamber in fluid communication with a concentrated draw solution and a semi-permeable membrane coupling the first chamber and the second chamber and means for introducing a plurality of seeds into the first chamber, wherein the plurality of seeds cause nucleation of at least a portion of the at least one solute when the first solution is introduced into the first chamber. 18. the system of claim 17 further comprising a separation module in fluid communication with the second chamber for recovering at least one of a solvent stream and draw solutes. 19. the system of claim 18 further comprising means for recycling draw solutes into the concentrated draw solution. 20. the system of claim 17 further comprising a recovery module in fluid communication with the first chamber for recovering precipitated solutes. 21. an apparatus for the treatment of a solution using osmosis comprising: a chamber configured for receiving a first solution comprising a solvent and at least one solute a membrane module disposed within the chamber and comprising a semi-permeable membrane having an exterior surface in fluid communication with the first solution and an interior surface for receiving a concentrated draw solution and means for introducing a plurality of seeds into the chamber, wherein the plurality of seeds cause nucleation of at least a portion of the at least one solute in the first solution in the chamber. (Results 99)

Search 3: TAC=(2 and wastewater) (Results 3)

Search 4: TAC=(2 and direct osmosis) (Results 0)

Search 5: TAC=(2 and ion exchange) (Results 2)

Search 6: TAC=(2 and osmosis) (Results 6)

Title: PROCESS FOR SEPARATING HYDROCARBONS

Abstract: Source: US3819742A ABSTRACT OF THE DISCLOSURE The invention relates to a process for separating mixtures of hydrocarbons, notably conjugated diene hydrocarbons, from mixtures containing the same, by the general technique of permeation or pervaporation through specific membranes. The specific membranes used are formed of a high polymer comprising functional groups chemically combined by covalent bonding within the polymer forming the said membrane, the said groups possessing a physicochemical affinity, notably a capacity to complex, with respect to one of said hydrocarbons and, substantially, the absence of such a capacity with respect to other hydrocarbons of the mixture. For the separation of dienes, such as butadiene and pentadiene, membranes are used containing active nitrile, pyrrolidone, N-substituted groups, such as N-alkyl groups, notably N-methyl or N-methyl-pyrrolidone. The membrane can be obtained, for example, from a vulcanized butadiene-acrylonitrile rubber, which can contain about 5 to 60 percent acrylonitrile, and notably from 20 to 30 percent. The present invention relates to the field of the separation of mixtures of hydrocarbons. The invention relates more particularly to the separation of conjugated diene hydrocarbons from mixtures also containing saturated or simple ethylenic hydrocarbons. The known processes for the industrial separation of hydrocarbons usually make use of the technique of liquidliquid extraction or extractive distillation. In liquid-liquid extraction, for instance, sulphuric acid is used to extract the isobutene from a cut of C₄ hydrocarbons already previously depleted of butadiene. The sulphuric acid in fact permits selective dissolving of the isobutene from the C₄ hydrocarbon mixtures. An example of extractive distillation is that of the separation of dienes in cuts of C₄ and C₅ hydrocarbons, the butadiene being separated from the CY cut and the 1-3 pentadiene from the C₅ cut. In this case, acetonitrile is used as a selective solvent. The petroleum industry also uses N-methyl-pyrrolidone as a solvent for the extraction of butadiene and pentadienes. The drawback to said known separation processes is that their yield decreases in proportion as the extraction or distillation evolves. Furthermore, they imply the use of bulky installations and a large equipment, and are therefore costly. The cost of maintaining said units is also high. Efforts have already been made to overcome these various drawbacks by passing the mixture of hydrocarbons to be separated over porous substrates containing a selective extraction solvent. As an illustration, U.S. Pat. No. 3,244,763 proposes stripping the isobutene from a C₄ hydrocarbon cut by passing the hydrocarbon mixture across a porous substrate impregnated with sulphuric acid. The isobutene is pumped through said substrate owing to the action of the sulphuric acid which is secured thereto. The isobutene can thus be removed from the other side of the wall of the porous substrate, by a solvent such as hexane. Similarly, United Kingdom Pat. No. 1,090,096 suggests a separation treatment which, instead of being applied to hydrocarbons employs hydrometallurgical compounds. More particularly, it deals with the separation of uranyl nitrate from solutions also containing iron nitrate and aluminium nitrate. To carry out separation, the solutions are flowed over a porous support on which there is deposited a coat of polyvinyl chloride plastified with a tributyl phosphate or by other phosphoric esters. In the examples illustrating the prior art which have been mentioned, the selective solvent is only physically integral with the porous support. This is exactly the case of a support impregnated with sulphuric acid. It is the same thing when the porous support is coated with polyvinyl chloride plastified with tributyl phosphate, which acts as a solvent. In polyvinyl chloride, as a matter of fact, the tributyl phosphate forms a simple physical, though intimate, mixture with the macromolecules of the vinyl chloride polymer. The plasticizer is not, however, chemically bonded to the macromolecule. In other cases, it has been suggested that membranes without electrical charges should be used to separate metallic ions. Such membranes carry functional groups adapted to the nature of the ions to be separated. Said separation techniques are illustrated by U.S. Pats. Nos. 3,450,630 and 3,450,631 and obviously do not apply to the separation of hydrocarbon mixtures. Other documents embodying the state of the technique will also be studied in detail hereinafter. U.S. Pat. 2,388,095 relates to a process for refining mineral oils particularly in order to separate iso-olefins from mixtures thereof with normal olefins. The mixtures of gas to be treated is introduced into a high-pressure compartment separated from a low-pressure compartment by a membrane which is maintained on a perforated metal plate. Gas fractions enriched with one or the other components of the mixture are collected on either side of the membrane. The description of U.S. Pat. 2,388,095 mentions that the use of rubber membranes as solid solvents to separate saturated hydrocarbon gases from unsaturated hydrocarbon gases is known. The comparative example given in the patent shows that separation with such a rubber membrane is not satisfactory. U.S. Pat. 2,388,095 suggests other types of solid solvents, notably membranes obtained by the polymerization of isobutylene or by the copolymerization of an iso-olefin such as isobutylene with a conjugated diolefin. Such membranes act as solid solvents with respect to iso-olefins and are therefore unsuitable for separating conjugated diene hydrocarbons from the hydrocarbon mixture containing them. This patent also teaches that rubber membranes are not satisfactory. Furthermore, the process of U.S. Pat. 2,388,095 is only applicable to the separation of gaseous mixtures. United Kingdom Pat. 1,069,231 relates to a process for separating fluid or gaseous mixtures, and notably an improved apparatus for carrying out said process. The technique used depends on the phenomenon of permeation or pervaporation already described in the literature (see United States Pats. 2,540,151 and 2,540,152) wherein one of the constituents of the mixture to be separated dissolves in the membrane and migrates through the latter under the influence of a pressure or concentration gradient. United Kingdom Pat. 1,069,231 is an example of prior document which illustrates the practical application of such a technique. The object of this patent is an apparatus permitting a large, active membrane surface area per unit volume and defines the technological parameters (pressure, thickness of the membrane, etc.) providing the best results. The indications relate neither to the nature of the membranes used nor to that of the mixtures separated. Moreover, the specific examples of United Kingdom Pat. 1,069,231 relate to the purification of sea-water, organic products or the separation of carbon dioxide from certain mixtures. United Kingdom Pat. 1,069,231 does not, therefore, teach means adapted to separate hydrocarbons, and it does not define the membranes which could be suitable for such an application. French Pat. 1,371,343, with its additions 72,416, 72,867 and 72,899, as well as French Pat. 1,568,217 relate to semi-permeable membranes, which contain active groups grafted into the mass. Said groups can be acid or basic groups, such as carboxylic acid groups, or originating in a basic monomer of the pyridine or amine type. Such membranes can be used for ion exchanges in the techniques of electrodialysis or reverse osmosis. Furthermore, their chemical structure is peculiar, as their skeleton consists of a perhalogenated polyolefin. The various aforesaid French patents do not therefore describe membranes which can be used for the separation of mixtures of hydrocarbons. United States Pat. 3,225,107 concerns, generally speaking, a process for separating organic compounds in the form of a liquid mixture by a permeation technique using a polymeric membrane onto the surface of which another polymer has been grafted. Said grafting can be carried out on one and/or the other surface of the membranes, but in any case, as is mentioned in the specification and illustrated in the appended drawings to said Pat. 3,225,107, it concerns membranes consisting of a thick, permeable support and a thin film applied to the surface thereof which provides selective separation. Said surface grafting is effected by the polymerisation of an active monomer according to conventional grafting techniques. When the support has a thickness of from 12.5 to 25 microns, the film grafted on the surface is no thicker than 2.5 microns. The constitution of the membrane is therefore heterogeneous inasmuch as the molecules of the component to be separated first come into contact with the grafted film, then pass through a thick layer of inert, porous material before arriving at the other side of the membrane, having optionally passed through another grafted film if grafting has been effected on both sides of the membrane. Such heterogeneity is an obstacle to the use of such membranes for the separation of certain gaseous or liquid mixtures. In certain cases, in fact, the component to be separated can in actual fact dissolve in the surface grafted film, but it is then stopped by the thick support layer whereby separation cannot take place. If the support layer is porous, the separation level remains insufficient and the overall yield of the operation is low. Finally, United States Pat. 3,225,107 vaguely mentions the application of the process of the separation of various mixtures of hydrocarbons, but it does not teach the means for separating conjugated diene hydrocarbons from mixtures containing same. Other prior documents describing the general technique of permeation are United States Pats. 2,953,502 and 2,981,680. The first is limited to the separation of azeotropic mixtures. The second relates to the separation of various mixtures and has as an object a process using two different types of membranes selective with respect to certain components of the mixture. The apparatus for carrying out said process is described in detail. The process is especially applicable to the separation of azeotropic mixtures, such as water and pyridine. Fractionation of mixtures of hydrocarbons and those containing conjugated diene hydrocarbons is not contemplated in said last patents. Generally speaking, the invention relates to a process for the separation of mixtures of hydrocarbons, which does away with the drawbacks of the industrial technique of selective extraction by solvent and extractive distillation, and makes use of specific polymer membranes applying the general technique of permeation or pervaporation. The invention relates more particularly to a process for the separation of conjugated diene hydrocarbons from mixtures also containing saturated or simple ethylenic hydrocarbons. A particular application of the invention is the separation of butadiene from the isobutene of a petroleum cut of C₄ hydrocarbons. Another application of the invention consists in the separation of isoprene and pentadiene. Another application of the process of the invention consists in the separation of isobutene from a mixture containing isobutene and 1-butene. Other advantages and other possibilities of application will become apparent to those skilled in the art in the detailed description which follows. The object of the invention is a process for the separation of a mixture of hydrocarbons, particularly conjugated diene hydrocarbons, from mixtures containing the same, by the general technique of permeation and pervaporation through an improved membrane, characterized in that the said mixture is contacted with a membrane formed of a high polymer comprising functional active groups chemically combined by covalent bonding within the polymer of which the said membrane is made, the said groups having a physicochemical affinity, notably a capacity to complex with respect to one of said hydrocarbons and, substantially, the absence of such a capacity with respect to other hydrocarbons of the mixture, and that a pressure gradient or chemical potential is applied to the said improved membrane in a known manner, which permits the recovery, on either side of the membrane, of a fraction enriched by the hydrocarbon having selectively passed through the membrane, and a fraction containing, predominantly, the other hydrocarbons of the mixture. The new specific membranes used in the process of the invention can be formed by chemical modification of a well known basis polymer which is a plastic material or an elastomer. Polystyrene, polyethylene, polyvinyl chloride or polytetrafluoroethylene ("Teflon(R)") can, for example, be used as a plastic material. Preference is generally given to elastomer membranes owing to the fact that the macromolecular chains are more mobile and higher coefficients of diffusion are thus obtained. The starting materials for such elastomers are natural and synthetic rubbers, such as, among others, copolymers of ethylene and propylene, butyl rubber, polyisoprenes, polybutadienes, polyoxypropylene. The aforesaid polymers are used in the form of a membrane, that is to say, a thin film. In practice, membranes of a thickness of one thousandth of a millimeter to 0.5 millimeter are suitable. Theoretically, thicker membranes can be used, but they provide lower separation rates. To obtain the best results, a minimum thickness is used, compatible with mechanical strength and long life. It is usual to apply the membrane to a porous support, which contributes to the mechanical strength of the whole. The membrane itself is not, therefore, subjected to mechanical stresses and it can be very thin, as little as one micron for example. The conventional techniques for preparing such membranes from crude basis polymer material are known. A first technique consists in moulding the polymer material under pressure. It does not permit membranes thinner than about one tenth of a millimeter to be obtained, but cross-lining or vulcanization can be effected simultaneously in the press. According to a second technique, which is preferred for the requirements of the invention, a polymer solution is prepared in a solvent such as an aromatic hydrocarbon like benzene, chlorinated solvents such as chloroform, chlorinated aromatic hydrocarbons, etc. The solution also usually contains vulcanization ingredients. A form corresponding to the membrane to be manufactured is soaked in the polymer solution, the concentration of which notably permits the thickness

of the final membrane to be varied. The form is dried gently to evaporate the solvent, first at ambient temperature, then in an oven at 40° C. with nitrogen or another inert gas to prevent oxidation, and finally at temperatures of about 140 to 160° C. It is essential to evaporate all the solvent and to avoid bubbles in order to obtain a thin, continuous membrane. This known technique enables elastomer membranes one hundredth of a millimeter thick to be obtained easily. Generally speaking, and in the case of an elastomer membrane, the use of a vulcanized membrane is suitable for the practical embodiment of the invention. The imperative condition is that the basis membrane which does not contain active groups cannot dissolve in the liquid phase of either of the components of the mixture to be separated. Moreover, an elastomer membrane is fragile if it is not 'vulcanized'. In all cases where one of the components is liquid, a vulcanized membrane should be used. The means for cross-linking or vulcanizing the aforesaid polymer are known in themselves. The operation may be effected with sulphur vulcanizing agents, with peroxides or by irradiation. The preceding observations concern the nature of the basis high polymer used to make the membrane of the invention and the practical modes for embodying it. It is a question of the conditions relating to the substrate of the membrane as the latter should, furthermore, have other characteristics. In the general definition previously given it was stated that the macromolecules of the polymer have chemically functional groups chemically combined by covalent bonding within the polymer, the said groups having a physicochemical affinity with respect to one of the components of the mixture to be separated, and particularly one of the hydrocarbons. The functional groups have as an essential role to increase the selectivity that a membrane constituted of the same basis polymer without functional groups may have with regard to a certain mixture of hydrocarbons. Within the meaning of the present invention, the expression "functional groups chemically combined by covalent bonding within the polymer" means that the functional groups are distributed evenly throughout the polymer mass, as opposed to membranes consisting of a support-skeleton with an active film on the surface thereof. In other words, when a membrane according to the invention is used, the molecules of the selectively separated hydrocarbon pass through the membrane and always come into contact with the same composition of material throughout the total thickness of the membrane, the distribution of functional groups being even in the mass throughout the thickness of the membrane. The functional groups in question can either be fixed chemically by grafting onto the macromolecules of a preexisting high polymer, or directly integrated with the skeleton of the macromolecular chains during polymerization with another monomer as is the case with copolymers where one of the monomers has an active functional group. The following examples of embodiment will be helpful in defining the general notion of physicochemical affinity. In the separation of dienes such as butadiene and pentadiene it is known, through the teachings of extractive distillation, that certain functional groups can be present in the solvents used to permit selective extraction. Thus, pyrrolidone alone does not permit the dienes to be extracted from C₄-C₅ hydrocarbon cuts, whereas N-methyl-pyrrolidone provides selective extraction of butadiene and pentadienes. The presence of the N-substituted group therefore appears to be connected with the selective capacity of the solvent. Similarly, the decisive function played by nitrile groups has been noticed when acetonitrile is used as a solvent for the extraction of dienes from C₄-C₅ hydrocarbon mixtures. The acetonitrile acts by increasing the boiling points of said compounds. In liquid-liquid extraction to separate isobutene, advantage is taken of the property possessed by sulphuric acid to selectively complex isobutene in a C₄ hydrocarbon cut depleted of butadiene. The active role of sulphuric acid should therefore be noted. From the above examples, and others, the nature of functional groups which increase the selectivity of a membrane can be foreseen. These functional groups should be the same as those possessed by a liquid organic solvent having a particular affinity with respect to one of the hydrocarbons of the mixture to be separated. This affinity is the result of the formation of an electronic complex characterized by a resonant structure between the solvent molecules and the molecules of the said hydrocarbon. A practical criterion exists which permits one skilled in the art to examine a posteriori the role of intensifying the selectivity of the active groups. This criterion is that the swelling of a membrane with active groups increases its selectivity towards a given mixture of hydrocarbons. This selectivity is a more effective selectivity than is the selectivity of a membrane with the same basis structure but without active groups. This increase in the swelling of the improved membrane as compared to conventional membranes proves the electronic complex formation between the active groups of the improved membrane and one or several components of the mixture to be separated. Polymers can be obtained in which the active groups are combined with macromolecules, by being chemically bonded thereto, by the usual techniques such as grafting or copolymerization. For the purpose of the grafting which should take place in the basic polymer mass, the polymer and at least one compound providing active groups are contacted with catalysts containing peroxide or diazoic compounds. Simple heating is sometimes sufficient to obtain said grafting. In the case when, as is preferred, elastomer membranes are used, the membrane should retain its elastomeric properties when grafting has ended. For copolymerization, the usual techniques are used, employing radical or ionic catalysts or which employ simple heating. Examples of such techniques will be given hereinafter with respect to particular applications of the process of the invention. It is essential to note that the component selectively separated from the mixture diffuses through the improved membrane, but that after the passage of said component the membrane remains chemically unchanged. It is thought that the molecules of the selectively separated hydrocarbon, whether they be gaseous or liquid, when they are contacted with the membrane, pass through the macromolecules of the membrane in a complexed state, the electronic structure of the selectivity permeating species being different during its diffusion from that of the said species in its normal electronic configuration. When separation is completed the membrane is ready to be reused without further treatment. A fundamental difference is thus observed compared with certain techniques using exchange resins, or others in which it is compulsory to carry out a regeneration treatment to remove the component, selectively fixed on this type of resin. Owing to this property, it can also be understood that the process of the invention is perfectly adapted to continuous operation. Elastomer membranes permit high diffusion coefficients to be obtained, particularly owing to their use at a temperature very much higher than their glass transition point. It should also be noted that following the usual TO vulcanization treatment, the active groups which are grafted or are part of the polymer macromolecule are not modified. In order to increase the yield during separation, it may be advantageous to contact the mixture of components in a liquid state. In a liquid phase, the density of the selectively permeating species is very high and the yield of the separated component increases. Owing to the conditions previously specified with respect to the polymer substrate, the polymer skeleton does not prevent migration of the molecules of the component to be separated. It should also be noted that, during transfer of the component through the membranes, two parameters exert an influence, they are, the electronic interaction of the component with the active groups of the improved membrane and the value of the diffusion coefficient through the membrane. It is understood that the overall action exerted by the membrane on the component to be extracted is the sum of the action of the active groups chemically combined by covalent bonding with the polymer and that of the basis polymer proper. Consequently, the action peculiar to the polymer substrate should be such that it encourages the action of the active groups. Said action can nevertheless be inoperative, or slightly unfavorable. Some examples of application will now be given by way of illustration. For the separation of dienes from hydrocarbon mixtures containing the same, a membrane containing nitrile active groups can be used, and particularly a membrane containing a butadiene acrylonitrile-copolymer. The acrylonitrile content of the copolymer can be in the range of about 5 to 60 percent. It is advantageously from 20 to 30 percent. Some copolymers of this type are known under the name of "Buna N." Others are put on the market by the Socit Plastimer (France) under the name "Butacryl." A membrane containing butadiene-acrylonitrile copolymers has the property of complexing the conjugated dienes owing to the electronic affinity between the nitrile groups and the dienes. Other active groups for the separation of conjugated dienes are of the N-substituted type or the pyrrolidone type. N-alkyl groups, such as the N-methyl group can be mentioned. Examples of compounds providing such active groups are N-methyl-pyrrolidone, N-vinyl-pyrrolidone and maleic N-methyl-imine. When said groups are fixed by grafting onto an elastomer, the membrane obtained has the property of selectively extracting butadiene and pentadiene from the hydrocarbons treated. Polymers bearing N-substituted grafted groups, such as N-methyl groups, can be obtained by the usual techniques previously mentioned. As an example, rubbers modified with N-methyl pyrrolidone were described in the Bull. Soc. Chim. 1961, p. 1433 by Christian Pinazzi, JeanClaude Danjard and Ren6 Pautrat. Such modified rubbers bear a variable number of groups fixed to the molecule, and may notably amount to between 10 and 30 percent by weight based on the initial polymers. The rubbers obtained are converted into said improved membranes by the solvent evaporation technique previously described. Suitable solvents are chlorinated aromatic solvents and heavy ketones. N-substituted groups, such as N-alkyl groups or pyrrolidone groups, can also be grafted onto various plastic materials such as polyacrylonitrile (see, for example, Graft Polymers, p. 78 by Battaerd and Tregear, series Polymer reviews No. 16, Interscience Publ. 1967). A third category of membrane, which is suitable for the separation of isobutene, is prepared from polymers comprising combined or grafted strong acid groups. An example of such polymers is described in French Pat. No. 6941159 which relates to a "process for the preparation of sulphonated polymers and the products obtained." Elastomer substrates suitable for the manufacture of said sulphonated polymers are polybutadiene and polyisoprene rubbers and ethylene-propylene copolymers. Such sulfonic groups can also be fixed onto plastic materials such as polystyrene, polyethylene and polytetrafluoroethylene ("Teflon"). Fixing on polystyrene is described, for instance, in "Chemical Reactions of Polymers, pp. 280-283 by H. M. Fettes, series High Polymers, vol. XIX, Interscience Publ. 1964. All the membranes in this category enable isobutene to be separated from a mixture containing isobutene and 1-butene. According to the invention, it is also advisable to apply a pressure gradient or chemical potential to the membrane to permit migration of the selectively selected component through the said membrane. Said chemical potential gradient can notably be obtained by establishing a difference in partial pressure of the component to be separated on either side of the membrane, a difference in concentration of said component or a difference in temperature. Pressure can advantageously be exerted on the surface of the membrane with which the mixture is in contact, or the vacuum applied to the other surface of the membrane, that is to say, that from which the separated component is collected, or both said means can be applied together. It may also be advisable to use a temperature gradient between the two mediums separated by the membrane. The specific examples hereinafter show, notably, that lowering the temperature enables a higher yield of separated gaseous constituents to be obtained. One of the devices for carrying out the process of the invention comprises, essentially, an enclosure separated by a membrane into at least two compartments, the said membrane being integral with a flat or cylindrical porous support, means for introducing the mixture to be separated into one of the compartments and means in the other compartment for withdrawing the separated components, as well as means for applying a pressure gradient on either side of the said membrane. Thus, in the upstream compartment, the mixture to be separated is caused to reside or circulate at atmospheric pressure, or under pressure, either in the gaseous state or in the liquid state. In the downstream compartment, the separation product, or permeate, is withdrawn by a gas or liquid carrier or extracted under vacuum. The invention will now be illustrated by some of its modes of embodiment with reference to the appended drawings in which: Fig. 1 shows a diagrammatic cross sectional view of a device for carrying out the process with a membrane disposed on a porous support. Fig. 2 is another device embodying a membrane integral with a porous, tubular support. Fig. 3 is a variant of the device of Fig. 2. Fig. 4 is a graph showing the influence of the temperature on the separation rate. As can be seen in Fig. 1, the device comprises an enclosure or chamber 1 separated into an upstream compartment 2 and a downstream compartment 3 by a porous support 4 which can be planar, convex or concave. The portions of chamber defining compartments 2 and 3 are maintained by side flanges 5, 6. A membrane 7 is integral with the porous support 4. A pipe 8 enters compartment 2 to supply the mixture to be separated under pressure. Another pipe 9 is used to withdraw the excess mixture from the upstream compartment 2. A pipe 10 is provided in compartment 3 to extract the permeate. In the device of Fig. 2, chamber 11 is cylindrical in shape. It is separated into an upstream compartment 12 and a downstream compartment 13 by a tubular porous support 14 bearing a membrane 17 about the entire periphery thereof. As is the case in Fig. 1, the mixture to be separated is introduced through pipe 18 and the excess mixture is withdrawn from compartment 12 through pipe 19. Pipe 20 is used to withdraw the permeate from compartment 13. Fig. 3 shows a device similar to that of Fig. 2. In this case, chamber 21 is also cylindrical and the porous support 24 is tubular. However, it is the inner surface of tube 24 which is covered by membrane 27. The upstream compartment 22 is situated within the tube and the downstream

compartment 23 is outside it. The mixture to be separated is introduced through tube 28 and the excess mixture is withdrawn through pipe 29. The permeate is recovered by means of pipe 30. The invention will now be illustrated, without being limited by specific examples of embodiment employing the devices shown in the appended drawings. EXAMPLE 1 A mixture of hydrocarbons consisting essentially of butadiene and isobutene was treated. Rubbers made of butadiene-acrylonitrile polymers, sold by the Societe Plastimer (France) under the name of "Butacryl" were used as membranes. Product BT is a 20 percent acrylonitrile polymer and product BT contains 30 percent acrylonitrile. When vulcanized, said products have the following specific gravity characteristics: Specific gravity: type BT 205: 0.98; type BT 305: 0.99. In the crude state the Mooney viscosity is respectively: With BT 205=45 to 55; with BT 305=50 to 55. The vulcanization formulation used is as follows; the parts being by weight Rubber

-----100 Zinc oxide -----5 Stearic acid -----2 Sulphur -----1.5 Accelerator -----1.5 (cyclohexyl benzothiazyl-sulfenamide) After vulcanization at 1530 C. for 20 minutes, the obtained membranes possess the following characteristics: With BT 305: Modulus at 300 percent elongation: 15.5 kg./cm² Tensile strength: 25 kg./cm² Elongation (at breaking): 670 percent Swelling by volume in toluene (measured at ambient temperature): 1.60 percent Vulcanized membranes are obtained with BT possesses similar characteristics, with the exception of swelling in toluene, which is 192 percent. The membranes used had a thickness of 150l in the case of those manufactured with BT 205 rubber, and 300At for those made from BT 305 rubber.

As a comparison, membranes were also made of pure polybutadiene containing no acrylonitrile and also having a thickness of 300 g. After vulcanization the cross linking of the membranes was estimated to be about 3.4 percent. The device of Fig. 1 was used with a planar porous support 4 corresponding to the useful surface of membrane 7 equivalent to 38 cm.². The pressure in the upstream compartment 2 was 2 bars. The pressure in the downstream compartment 3 was 0.1 bar absolute, or 7.6 cm. Hg. The gaseous mixture introduced through pipe 8 contained, by volume 36 percent butadiene and 64 percent isobutene. Using a 300g vulcanized membrane made with BT 305, and at 20 degrees C., a diffusion velocity of butadiene of 0.4 g./h. through membrane 7 is measured, with a coefficient of separation of 2.85. With a conventional rubber membrane containing no nitrile groups, at 200 C. a diffusion velocity of 5 g./h. is measured, but the coefficient of separation in two independent measurements is 1.02 and 1.01, which shows that there is no effective separation of butadiene taking into account mistakes in measurements. This example, therefore shows the decisive influence of the presence of nitrile functional groups in the polymer improved membrane. These groups have a structural electronic affinity with respect to butadiene and permitting it to be separated from a butadiene-isobutene mixture. EXAMPLE 2 Example 1 was repeated, treating a mixture comprising 75 percent butadiene and 25 percent isobutene by volume on a membrane containing a butadiene-acrylonitrile copolymer of the type "Butacryl" BT 205 having a thickness of 150 microns. The coefficient of separation measured is between 2.5 and 3 for the following conditions of pressure: Outlet pressure of the permeate: 1 bar Difference in pressure between the upstream compartment and the downstream compartment (pressure gradient): 0.8 bar The useful surface of the membrane was 38 cm.² and the device used was that shown in Fig. 1. Under these conditions, at a temperature of 170 C., the mixture being introduced in the gaseous state and the downstream compartment flushed with nitrogen to entrain the permeate, the rate of separated butadiene measured corresponded to 6.3 tons per year and per M.² of membrane. By operating at 100 C. and using the mixture to be treated in a liquid state, and retaining the sweeping of the downstream compartment with nitrogen, a yield of separated butadiene corresponding to 6.3 tons per year and per M.² of membrane was measured. EXAMPLE 3 This example illustrates the influence of the temperature on the yield of the separated gaseous component. Example 2 was repeated under identical conditions, but the temperature was altered. The results obtained are given in Table I.

TABLE I The influence of temperature on the yield of separated butadiene. Yield g./h., membrane Temperature 0 C.: surface 38 cm.² -----8 -----3.40 -----3.25 11 -----2.40 12 -----2.16 -----1.40 -----0.72 -----0.40 -----0.26 -----0.20 -----0.16 -----0.14 -----0.13 Fig. 4 is a graph showing, in abscissa, the temperature in 0 C. and, in ordinates, the separated butadiene

yield expressed in tons per year and per m.² of the membrane, according to the results given in Table I above. It is seen that the yield increases as the temperature decreases. It may, therefore, be advantageous to work at temperatures in the range of about 5 to 200 C. EXAMPLE 4 To obtain butadiene of a high degree of purity, a mixture containing, by volume, 75 percent butadiene and 25 percent isobutene was treated according to the invention in four successive separation stages. Each of the stages being of the type shown in Fig. 1. The characteristics and conditions of treatment were the same as in example 2. At the outlet of the 4th separation stage there was obtained a butadiene containing less than 1 percent impurities. Equivalent results are obtained by treating the mixture to be separated in a series of devices comprising tubular membranes on porous supports of the type shown in FIGS. 2 and 3. EXAMPLE In this example, a mixture containing 50 percent isoprene and 50 percent cis-trans-1,3-pentadiene by volume was treated. The device used was the type shown in Fig. 1 with an effective membrane surface of 38 cm.². The outlet pressure of the permeate was 0.1 bar and the difference in pressure between the upstream compartment and the downstream compartment (pressure gradient) was 1 bar. The membrane used was a butadiene-acrylonitrile copolymer elastomer membrane of the type Butacryl BT 305 with 30 percent acrylonitrile having a thickness of 150 microns. Under these conditions there was obtained a coefficient of separation of 2.5 and a yield of 1,3-pentadiene separated at 170 C. corresponding to 1 ton/year/m.², the mixture being contacted in the liquid state with the membrane and the separated pentadiene in the gaseous state. With a BT 305 membrane of 300 microns, treating the same mixture under an upstream pressure of 1.4 bar and a downstream pressure of 0.1 bar, a coefficient of separation of 2 plus or minus 0.5 and a pentadiene yield of 1.2 g./h. at 360 C. were obtained. EXAMPLE 6 In this example, a commercial C₄ cut was treated by pervaporation. The device

used is the type shown in Fig. 1, with an effective membrane surface of 44 cm.². The outlet pressure of the permeate is 1.0 bar and the difference in pressure between the upstream compartment and the downstream compartment (pressure gradient) is 0.9 bar. The membrane used is a butadiene-acrylonitrile copolymer elastomer of the type BT 308 containing 30 percent acrylonitrile vulcanized with dicumyl peroxide and having a thickness of 16 microns. The composition of the feed, permeate and the mixture retained on the membrane are given in table II hereafter. TABLE II Mixture C4 cut (feed) retained Permeate Percent: Isobutane -----0.6 0.7 0.2 n-Butane -----3.7 3.9 1.8 1-butene -----12.6 14.1 10.0 Isobutene -----83.8 35.6 21.4 Trans-2-butene -----6.3 6.4 5.8 Cis-2-butene -----6.1 6.0 6.1 Butadiene -----3 6.8 33.4 54.6 Under these conditions, the coefficient of separation of butadiene with respect to isobutene is 2.6 and the yield of permeate is 26.8 g./h., corresponding to a yield of 52 tons/year/m.². The invention is not limited to the aforesaid examples of embodiment. It can be applied to very diversified separations and, generally speaking to all mixtures of hydrocarbons which, in the prior art, were separated, or could be separated by liquid-liquid extraction or extractive distillation. For all said types of separation the invention teaches the use of improved membranes differing from the conventional ones in the fact that they are made of a high polymer comprising active groups chemically bonded with covalent bonding to macromolecular chains. The said active groups of the membrane having the property of forming electronic complexes with the permeating species, so that they replace the organic phase which forms either the extractant in liquid-liquid extraction operations, or, in the case of extractive distillation, the solvent which raises or lowers the boiling point of the compound to be extracted.

Classifications:

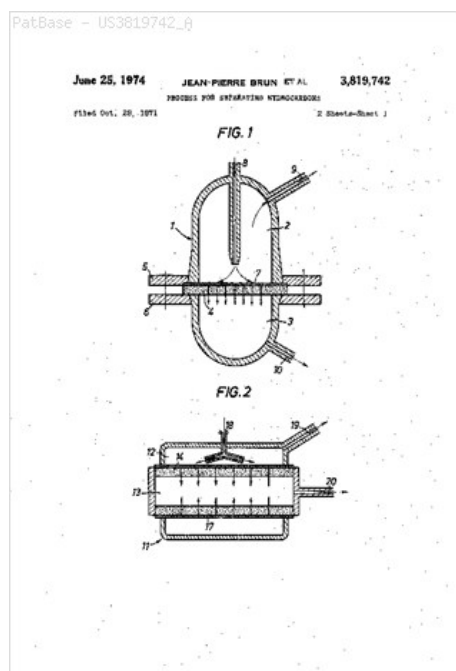
International (IPC 8-9): B01D53/22 B01D71/24 B01D71/82 C07C11/00 C07C11/12 C07C11/16 C07C11/18 C07C7/152 C10G31/00 (Advanced/Invention); C10G (Subclass/Invention)

International (IPC 1-7): B01D13/00 B01D53/22 C07C11/12 C07C7/00 C07C7/01 C07C7/02 C07C7/12 C07C7/152 C08F27/00 C10G31/00

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European: B01D53/22 B01D53/22M B01D61/36B B01D63/06 B01D71/24 B01D71/82 C07C7/152

US: 208/308 210/640 210/651 422/222 429/17 429/410 585/818 585/860 95/50 96/10 96/12



Publication number	Publication date	Application number	Application date
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DE2154288 A1	19720525	DE19712154288	19711030
DE2154288 B2	19760311	DE19712154288	19711030
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US3819742 A	19740625	US19710193494	19711028
US3930990 A	19760106	US19740458129	19740405

Priority:
FR19700039537 19701103 US19710193494 19711028 US19740458129 19740405

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Title: Chlorine-tolerant, thin-film composite membrane

Abstract: Source: US5271843A A semipermeable membrane suitable for reverse **osmosis** applications is prepared by interfacially reacting on a support an aromatic polyamine containing at least three and, preferably, four aromatic nuclei with a polyfunctional amine-reactive compound such as an aromatic polyacyl halide.

Classifications:
International (IPC 8-9): B01D69/12 (Advanced/Invention);
B01D69/00 (Core/Invention)
International (IPC 1-7): B01D61/02
CPC: B01D69/125
European: B01D69/12D
US: 210/500.37 210/654 427/245

Family:

Publication number	Publication date	Application number	Application date
US5271843 A	19931221	US19910756635	19910909

Priority:
US19910756635 19910909

Probable Assignee: FLUID SYSTEMS

Assignee(s): (std): ALLIED SIGNAL INC

Assignee(s): ALLIEDSIGNAL INC ; FLUID SYSTEMS

Inventor(s): (std): CHAU MICHAEL M ; LIGHT WILLIAM G ; SWAMIKANNU A XAVIER

Title: MOLECULAR SEPARATOR

Abstract: Source: US2005167346A The present invention discloses a method and apparatus for separating particles and dissolved matter from a fluid stream. Specifically, the present invention includes a first pressure source which transports untreated fluid into a separator annulus with a filter element disposed therein. The untreated fluid is placed under appropriate pressure sufficient to produce turbulent flow, increased particle kinetics and/or cavitation physics allowing the desired fluid to penetrate and pass into and through the filter media. The filtered fluid is then transported to a collection tank. The contaminant particulate matter retained by the filter media may be removed by the instantaneous reverse pressurization of the separator annulus by a second pressure source thereby removing the contaminant particles away from contact with the filter media, and which may then be transported to a waste collection tank or a concentrator for further treatment.

Classifications:

International (IPC 8-9): B01D17/02 B01D25/00 B01D25/30 B01D29/66 B01D29/68 B01D29/88 B01D36/00 B01D37/00 B01D46/04 B01D61/00 B01D61/14 B01D61/18 B01D61/20 B01D61/58 B01D63/00 B01D63/06 B01D65/00 B01D65/02 B01D65/08 B08B3/04 B08B7/04 B64D11/00 C02F1/00 C02F1/44 C02F9/00 C02F9/08 C12M1/34 E21B43/34 F04B9/113 F04B9/115 (Advanced/Invention); C02F1/32 C02F1/36 C02F1/38 C02F1/44 C02F1/48 C02F101/32 C02F9/02 (Advanced/Non-invention); B01D17/02 B01D29/66 B01D37/00 B01D61/00 B01D61/14 B01D61/18 B01D61/20 B01D63/06 B01D65/00 B08B3/04 B08B7/04 B64D11/00 C02F1/00 C02F9/08 C12M1/34 F04B9/00 (Core/Invention); C02F1/44 (Core/Non-invention)

International (IPC 1-7): B01D65/02 B64D11/00 C12M1/34

CPC: B01D61/025 B01D61/027 B01D61/58 B01D2313/44 B01D2317/025 B01D2321/00 B01D2321/2075 C02F2103/32 B01D61/22 B01D2313/24 C02F1/44 C02F11/12 C02F2201/006 B01D2313/105 B01D2313/125 B01D17/085 B01D17/0202 B01D61/00 B01D61/14 B01D61/142 B01D61/147 B01D61/18 B01D61/20 B01D63/06 B01D65/00 B01D65/02 B01D65/08 B01D2321/04 B01D2321/2033 B01D2321/2066 B01D2321/2083 C02F1/32 C02F1/36 C02F1/38 C02F1/441 C02F1/444 C02F1/48 C02F9/00 C02F2101/32 E21B43/34 F04B9/113

European: B01D17/02B B01D61/00 B01D61/02D B01D61/02F B01D61/14 B01D61/14B B01D61/14F B01D61/18 B01D61/20 B01D61/22 B01D61/58 B01D63/06 B01D65/00 B01D65/02 B01D65/08 C02F9/00 E21B43/34 F04B9/113 L01D313/44 L01D317/02D L01D321/00 L01D321/04 L01D321/20D L01D321/20F L01D321/20F2 L01D321/20H L01D61/02D L01D61/02F M02F1/32 M02F1/36 M02F1/38 M02F1/44 M02F1/44B M02F1/44D M02F1/48 M02F101/32 M02F103/32 M02F11/12 M02F201/00D8

US: 134/10 134/109 134/110 134/115.00RS 134/115R 134/123 134/13 134/13P 134/34 134/34S 134/56.00RS 134/56R 204/275.1 204/275.100S 204/542 210/106 210/108 210/134 210/134S 210/136S 210/137 210/137S 210/143 210/181 210/181S 210/195.1 210/195.2 210/209 210/223 210/223S 210/241 210/241S 210/251 210/251S 210/253 210/257.1 210/257.100S 210/257.2 210/257.200S 210/258 210/259 210/321.6 210/321.65 210/321.650S 210/321.66 210/321.660S 210/321.69 210/321.690P 210/321.690S 210/321.87 210/322 210/323.1 210/323.2 210/411 210/416.1 210/416.100S 210/433.1 210/456 210/636 210/637 210/641 210/650 210/652 210/741 210/748.01 210/748.02 210/748.1 210/764 210/768 210/770 210/771 210/774 210/785 210/791 210/798 210/804 210/805 210/806 210/85 210/85P 244/118.5 244/118.500P 435/287.1 435/287.100P 55/302 55/419 95/279 95/45 95/46 96/10 96/4 96/9

Family:

Publication number	Publication date	Application number	Application date
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WO05084189 A3	20061012	WO2005US02134	20050125

Priority:			
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US20070862930	20070927	US20080025523	20080204
US20080257427	20081024	WO2005US02312	20050125
US20080257529	20081024	US20080257617	20081024
US20110224875	20110902		US20110046410

Probable Assignee: TERVITA LLC

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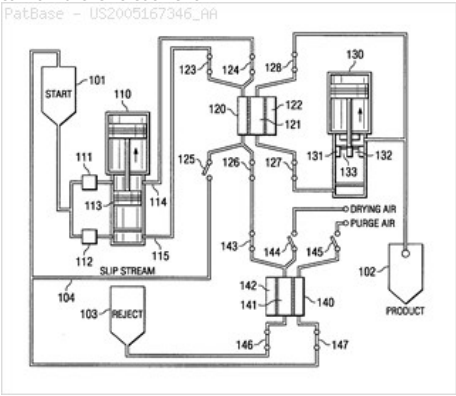
Assignee(s): WILMINGTON TRUST NATIONAL ASSOCIATION COLLATERAL T ; WILMINGTON TRUST NATIONAL ASSOCIATION COLLATERAL TRUSTEE AS ; CCS MIDSTREAM SERVICES LLC ; PLAINFIELD OFFSHORE HOLDINGS XII INC ; PLAINFIELD SPECIALTY HOLDINGS II INC ; JOHNSON RAYMOND F ; JOHNSON MARKLEY D

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Agent(s): MACRAE AND CO; CARSTENS YEE AND CAHOON LLP; SCOTT L HARPER; CARSTENS AND CAHOON LLP; CARSTENS AND CAHOON; CAHOON COLIN P; WALTER CHAD E; COLIN P; CHAD E; BELL NUNNALLY AND MARTIN LLP; CRAIG J

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GG GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SM SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW



Title: ANAEROBIC PRODUCTION OF HYDROGEN AND OTHER CHEMICAL PRODUCTS

Abstract: Source: US2008311640A Described herein are methods for producing chemical products by anaerobically fermenting a particular biomass using anaerobic bacteria. Such chemical products include hydrogen and other gases, acetic acid and other volatile organic acids, solvents, solids, and salts of volatile organic acids.

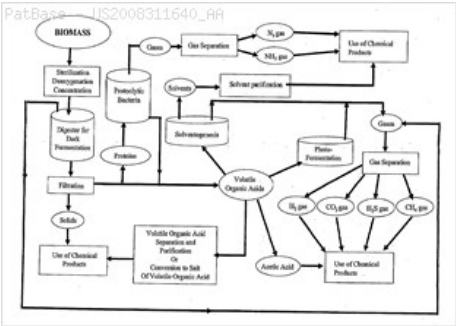
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International (IPC 8-9): C12M1/07 C12M1/12 C12M1/36 C12M3/00 C12N1/20 C12N9/04 C12P1/04 C12P3/00 (Advanced/Invention); C12M1/107 C12M1/36 C12M1/38 (Advanced/Non-invention); C12M1/36 C12M3/00 C12N1/20 C12N9/04 C12P3/00 (Core/Invention)

CPC: C12M21/04 C12M29/18 C12M29/20 C12M45/04 C12M45/20 C12M47/18 C12P3/00 Y02E50/343

European: C12P3/00 Y02E50/34B

US: 435/168 435/168P 435/252.1 435/252.100S 435/286.1 435/286.100S 435/290.4 435/290.400S 435/303.2 435/303.200S



Family:

Publication number	Publication date	Application number	Application date
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EP1877565 A2	20080116	EP20060751822	20060427
EP1877565 A4	20111116	EP20060751822	20060427
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WO06119052 A2	20061109	WO2006US16332	20060427
WO06119052 A3	20090423	WO2006US16332	20060427

Priority:

US20050678101P 20050503	US20050677856P 20050503	US20050678077P 20050503
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US20060912881 20060427	WO2006US16332 20060427	

Probable Assignee: ANAEROBE SYSTEMS

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Agent(s): BORDEN LADNER GERVAIS LLP; BROUGHTON JON PHILIP ET AL; WILSON SONSINI GOODRICH AND ROSATI; HOSTETLER MICHAEL J ET AL

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LC LI LK LR LS LT LU LV LY MA MC MD MG MK ML MN MR MW MX MZ NA NE NG NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SM SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Title: A novel method for the generation of water with reduced ionic solutes

Abstract: Source: GB200620970A A device comprising one or more proximal and distal chambers separated by a selectively permeable membrane which has a restricted but not absolute restriction of porosity with respect to dissolved solutes. This device is designed to generate a solution with a reduction in the concentration of these solutes distal to this membrane by the processes of forward and/or reverse **osmosis**. Such devices can further utilize those solutes initially present on the proximal side of the membrane but which have crossed the membrane themselves so that they then act as osmotic drivers and so facilitate the further movement of solutes across the membrane.

Classifications:
International (IPC 8-9): B01D61/00 C02F1/44 (Advanced/Invention)
CPC: B01D61/025 B01D61/002 B01D61/005 C02F1/445 C02F2103/08 B01D61/00 C02F1/44
European: B01D61/00B B01D61/00B10 B01D61/02D C02F1/44F M02F103/08

Family:

Publication number	Publication date	Application number	Application date
GB200620970 A0	20061129	GB20060020970	20061021
GB2442941 A1	20080423	GB20060020970	20061021

Priority:
GB20060020970 20061021

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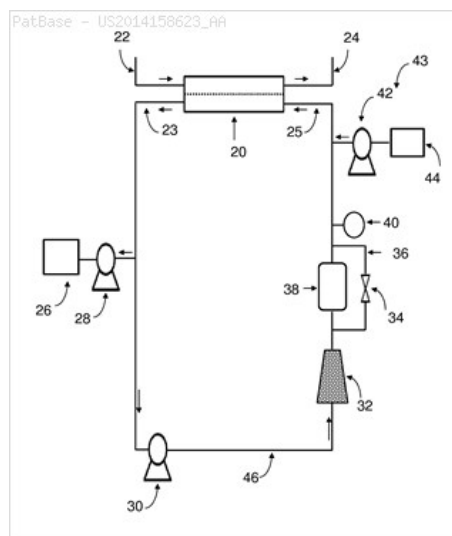
Assignee(s): PHILIP PETER MONRO

Inventor(s): (std): MONRO PHILIP PETER

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Abstract: Source: US2014158623A Systems and methods for managing the sodium concentration of a dialysate fluid during hemodialysis therapy and adjusting sodium concentration using a sodium management system to generate a sodium-modified fluid. The systems and methods also provide a mechanism for controlled addition of sodium ions to the dialysate to generate a predetermined total sodium concentration in a dialysate.

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AU2014212140 AA	20140807	AU20140212140	20140202
CN104994894 A	20151021	CN201480007132	20140202
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