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PATENTES
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20
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TECNOLOGÍAS QUÍMICAS: PRODUCCIÓN CIENTÍFICA

En la presente edición de este boletín se va a presentar una revisión de la producción científica en el campo de las tecnologías químicas de conversión de la biomasa para la obtención de biocombustibles, a través del análisis de las publicaciones identificadas en la base de datos Web of Science de ISI WoK. Con esta revisión se completan las realizadas en ediciones anteriores, donde se abordaron los otros tipos de procesos de conversión.

Hasta Junio de 2016, la producción científica a nivel mundial en el área objeto de estudio superó las 8000 publicaciones. El 85% son artículos en revistas especializadas y el 10% comunicaciones a congresos. El 7% son revisiones del estado del arte de la tecnología.

Los primeros artículos publicados datan de comienzos de la década de los noventa. Desde entonces, a excepción de los dos últimos años, la producción bibliográfica ha ido en aumento, experimentando un crecimiento extraordinario a partir del año 2006, de manera que el número de publicaciones de los últimos diez años representa el 95.5% del total y el de los últimos cinco, el 68.0% (Figura 1).

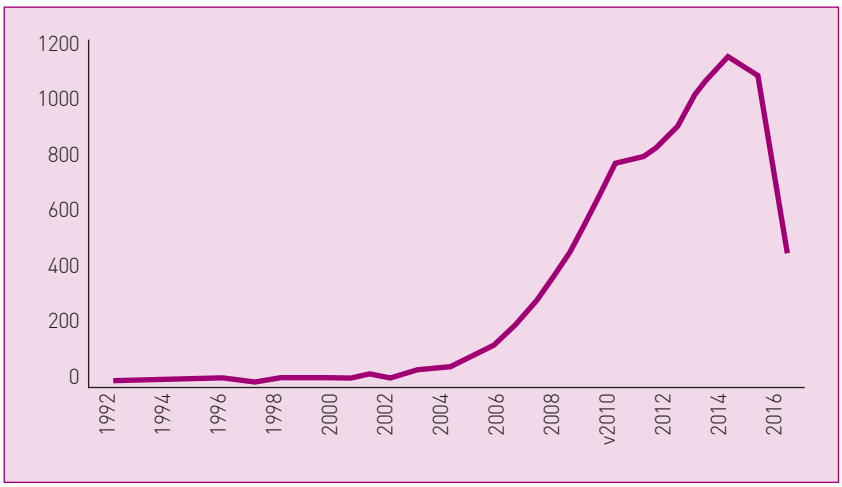

Figura 1: Distribución del número de publicaciones por años

En relación a las áreas de investigación en que Web of Science clasifica las publicaciones contenidas en su base de datos, señalar que el 42% pertenecen al área de Energía y Biocombustibles y el 39% al área de Ingeniería Química. A continuación, el 16% pertenecen al área de Biotecnología y Microbiología Aplicada, y el 12% a la de Química-Física.

Los países que ostentan el liderazgo en publicaciones son China y EE.UU, con el 16.3% y 12.6% de los artículos, respectivamente. A éstos les siguen India, Brasil, Malasia y España, con el 10.7%, 9.3%, 7.1% y 5.5%, respectivamente. Con contribuciones entre el 3.0% y el 5.0% se encuentran Turquía, Japón, Corea del Sur y Tailandia.

Resulta significativo que tan sólo se han identificado veintiún centros con más de 50 publicaciones y siete con más de 100. En la Tabla 1 se recogen los diez situados a la cabeza. En su mayoría se trata de Universidades y centros de investigación. Los más destacados son la University of Sains Malaysia, el Council of Scientific Industrial Research de India, el Indian Institute of Technology y la Chinese Academy of Sciences. A ellos corresponde el 1.94%, 1.83%, 1.82% y 1.80% de las publicaciones, respectivamente, lo que supone una aportación bastante exigua al total.

Tabla 1:

INSTITUCIONES LÍDERES A NIVEL MUNDIAL

Instituciones	Nº Publicaciones
University of Sains Malaysia (MY)	156
Council of Scientific Industrial Research, CSIR India (IN)	147
Indian Institute of Technology, ITT (IN)	146
Chinese Academy of Sciences (CN)	145
University of Malaya (MY)	133
US Department of Agriculture-USDA (US)	112
Tsinghua University (CN)	100
University of Putra Malaysia (MY)	98
Chulalongkorn University (TH)	95
Universidade Federal do Rio de Janeiro (BR)	83

Con los datos mencionados en párrafos anteriores, resulta que España, con 440 publicaciones, ocupa la sexta posición a nivel mundial. Las primeras datan del año 2000, produciéndose un despegue considerable a partir del año 2010. Desde entonces, se han publicado el 82% del total.
Son muy numerosas las instituciones españolas con publicaciones en este campo y en la Tabla 2 se muestran las principales. El Consejo Superior de Investigaciones Científicas (CSIC) se sitúa a la cabeza, con el 16.1% del total. Entre sus centros destaca el Insituto de Catálisis y Petroleoquímica, (ICP) al que pertenecen el 49.2% de sus publicaciones. Tras el CSIC, cabe resaltar la Universidad de Córdoba y la Universidad de Castilla La Mancha, con el 12.5% y 10.5% de las publicaciones.

Tabla 2:

INSTITUCIONES LÍDERES A NIVEL NACIONAL

	Instituciones	Nº Publicaciones
1	Consejo Superior de Investigaciones Científicas, CSIC	71
	Instituto de Catálisis y Petroleoquímica, ICP	35
	Instituto Andaluz de Ciencias de la Tierra (IACT)-Universidad de Granada*	9
	Instituto de Tecnología Química (ITQ)-Universidad Politécnica de Valencia*	8
	ICP-Universidad de Málaga*	6
2	Universidad de Córdoba	55
3	Universidad de Castilla La Mancha	46
4	Universidad Rey Juan Carlos	31
5	Universidad Complutense de Madrid	30
6	Universidad de Málaga	24**
7	Universidad de Barcelona	22
8	Universidad Pública de Navarra	18
	Universidad de Murcia	18
9	Universidad Politécnica de Valencia	16**
	Universidad de Zaragoza	16
10	Universidad de Extremadura	15

*Centros mixtos/unidades asociadas entre CSIC y Universidades
**Se incluyen las publicaciones de sus centros mixtos/unidades asociadas al CSIC

ANÁLISIS DE PATENTES

Durante el segundo trimestre de 2016 se han identificado 1204 familias de patentes en la base de datos WPI (World Patent Index) sobre tecnologías de conversión de la biomasa para la producción de energía. Tal como se viene observando en boletines anteriores, la mayoría de las referencias corresponde a invenciones para las que sólamente se solicita protección en países asiáticos (Tabla 3). Con el fin de ofrecer una visión más global de los actores implicados, éstas se van a excluir del análisis que se va a realizar en este Apartado.
Teniendo en consideración lo expuesto en el párrafo anterior, el 67.4% de las famílas se refiere a las tecnologías termoquímicas. El 28.5% y el 8.8% hacen referencia a las tecnologías bioquímicas y químicas, respectivamente. La tecnología de gasificación/pirólisis es la que cuenta con mayor número de resultados, 36.4% del total

Tipos de tecnologías de conversión de la biomasa	Nº Familias (Todos los ámbitos de protección)	Nº Familias (Ámbitos de protección exclusivamente asiáticos)
Tecnologías termoquímicas	**989**	**828**
Combustión directa	516	436
Gasificación/pirólisis	513	426
Tecnologías bioquímicas	**166**	**98**
Digestión anaeróbica	94	71
Fermentación de azúcares	75	28
Tecnologías químicas (transesterificación, Fischer-Tropsch síntesis de metanol)	**70**	**49**
Nº TOTAL FAMILIAS DE PATENTES	**1204**	**965**

Tabla 3. Número de familias de patentes clasificadas por tecnologías

Nota: Alguna invención puede incluirse en más de una tecnología

En la Tabla 4 se muestran los países líderes en protección. En primer lugar se encuentran las solicitudes internacionales (PCT), con 98 documentos; en segundo lugar se encuentra EE.UU., con 75. En tercer lugar y muy distanciado, se sitúa Brasil, con 25 documentos. En España, en el periodo analizado, se publicaron 8. En la Tabla 5 se recogen los ámbitos de protección más representativos de las invenciones correspondientes a las distintas tecnologías. Cabe resaltar que el 38% de las invenciones asociadas a tecnologías químicas cuentan con solicitudes en Brasil.

	País	Nº referencias
1	PCT	98
2	EE.UU. (US)	75
3	Brasil (BR)	25
4	EP	19
5	Rusia (RU)	17
6	Alemania (DE)	16

Tabla 4. Ranking por países (excluyendo países asiáticos)

TIPOS DE TECNOLOGÍA (Nº DOCUMENTOS)			
	Termoquímicas	Bioquímicas	Químicas
PCT	62	36	7
EP	15	3	2
Alemania (DE)	12	5	0
Brasil (BR)	13	4	8
EE.UU. (US)	54	22	5
España (ES)	6	2	1
Francia (FR)	8	1	1
Polonia (PL)	7	2	0
Reino Unido (GB)	4	1	0
Rusia (RU)	15	2	0
Turquía (TR)	6	0	0
Nº Familias totales	**161**	**68**	**21**

Tabla 5. Ámbitos de protección más solicitados por tecnologías (excluyendo países asiáticos)

En los Apartados posteriores se presenta una selección de los documentos de patentes identificados en este trimestre.

TECNOLOGÍAS TERMOQUÍMICAS
Patentes

COMBUSTIÓN DIRECTA		
Nº Publicación	Solicitante (País)	Contenido técnico
ES1147412	Álvarez Martin Juan (ES)	**Control device for boilers for burning fuel natural resources for water heating system of house.** The device has a circuit comprising a boiler that is provided with an input end and an outlet end. A conduit is partially located in an inner side of the boiler by passing flow of water to-be-heated and connected with an impulsion pump and a silo. Biomass fuel is burned in the boiler. A control unit is provided with first and second inputs for supplying water to the input and outlet ends, third input for supplying fuel into the silo, fourth input for adjusting water flow by the impulsion pump and fifth input fixed in another outlet end. Uses include but are not limited to chips, olive stones, nut shells and pellets.
GB2530732	BE Modern Ltd (GB)	**Solid fuel stove.** Disclosed is a solid fuel stove 1 comprising a firebox 14 having a grate 16 disposed therein for supporting solid fuel and a secondary air supply arrangement. The secondary air supply arrangement comprises at least one secondary air outlet 42 disposed above the grate 16 in an upper frontal region of the firebox 14 for supplying secondary air to the firebox 14. First and second 116 secondary air ducts are also supplied, each in fluid communication with at least one secondary air outlet 42 for conveying secondary air from a lower region to an upper region of the stove 1. The first and second secondary air ducts each have an upwardly extending duct section, each of which is laterally spaced and separated from one another along their lengths.
DE102014117654	CB Bioenergy GmbH (AT)	**Heating device for operation outside.** The system has a combustion chamber for burning pellets and a timber. The combustion chamber is connected to a chimney for discharging exhaust gases produced during combustion of the pellets and the timber. A pellet tank stores the pellets and the timber. An air introduction device supplies fresh air into the combustion chamber. A thermal ventilation shaft is coupled to the combustion chamber that is connected with the air introduction device such that preheated fresh air is introduced into the combustion chamber. A heat carrier is filled with mixture of water.
EP3023722	DF Mompresa SAU (ES)	**A transportable installation for drying wood chips.** A mobile chip drying installation, suitable for drying a mixture of wood chips, which uses the chips themselves as fuel for drying and which comprises a hot air generator, a trommel dryer, a fine particle separator system and a control system: the control system being linked simultaneously in data communication with the hot air generator, the trommel dryer and the auxiliary fine separator system, such that the hot air flowing out of the hot air generator circulates through the inside of the trommel dryer, in which they come into contact with the wood chips, thus removing humidity, in such a way that the flow of hot air coming out of the trommel dryer circulates through the auxiliary fine separator system.
US2016161127	Hill Richard L (US) et al.	**Pellet stove.** A pellet stove includes a hopper for storing pellets, a basket for receiving the pellets by gravity, a duct for conveying combustion air to the basket, and a conduit for conducting heated air away from the basket. The position of the basket is adjustable, such as by raising and lowering it, or by rotating it, so as to control the number of pellets in the area of most intense combustion. One or more burn plates, positioned below the basket, provide platforms on which pellets falling through the basket can burn down to a smaller size. The pellet stove requires no external source of power. The stove so constructed enables quiet, efficient and clean burning of the pellets.

COMBUSTIÓN DIRECTA		
Nº Publicación	Solicitante (País)	Contenido técnico
WO2016059231	Imerys Ceramics France (FR)	**Method for making fly ash.** A method of making fly ash comprising combusting a fuel (in the presence of a mineral additive, wherein the mineral additive comprises at least one silicate, fly ash obtained by said method and the use of said fly ash as a pozzolan, for example for use in a cementitious composition such as cement and concrete. The fuel may, for example, comprise one or more of coal, petroleum coke, lignite, biofuel (e.g. biofuel derived from biomass such as wheat straw, wood pellets, straw pellets, peat, lignocellulose, waste biomass such as bagasse, wheat stalks, corn stalks, oat stalks and/or energy biomass such as grasses of the Miscanthus genus), refuse- derived fuel (e.g. municipal solid waste, commercial waste, industrial waste, biomass waste and animal waste).
GB2533040	Jetmaster Fires Ltd (GB)	**Stove.** A stove for burning fuel comprises a fuel chamber, a viewing window at a front side of the chamber, and an airwash passage for passing external air along the inside of the window. An airwash control adjusts the amount of air provided by the airwash passage. A combustion air channel passes external air via a ceiling portion which extends along a ceiling of the chamber in a direction towards or away from the front of the chamber to one or more combustion air outlets which are further from the front of the chamber than an outlet of the airwash passage. A gas outlet hole may be formed in the ceiling of the chamber. The combustion air channel may comprise a tubular channel having air inlets a bend or serpentine section. The window may be formed in a door. A method of burning fuel in the stove is also claimed.
BR102014016983	Machado Marcos Aurélio Corrêa (BR)	**Method for treatment of pollutant gases from combustion of materials.** Method and apparatus for decomposition of pollutants produced in industrial processes or power plants, resulting from the burning of coal, fuel oil, biomass, incineration or equivalent, said decomposition comprising heating said gases by passing the gases in regime turbulent flow through a chamber filled with chemically inert material which forms tortuous ducts, with said heated material to a temperature above 600 degrees c .; said chemically inert material consists of a ceramic composite comprising a refractory matrix of inert material of low dielectric losses and a susceptor material with high dielectric losses when subjected to electromagnetic radiation of high frequency, which is generated by magnetron valves operating in a frequency band that goes to 912mhz 2415mhz inclusive. said susceptor material comprises one or more compounds selected from the group comprising co2o3, MnO2, NiO CuO, carbides, nitrides and borides being used, preferably the latter, in a proportion between 10% and 85% by weight. The ceramic composite can be in the form of one or more porous blocks that allow the passage of gas with low load losses, or, preferably, in irregularly shaped fragments with sharp edges and sharp corners.
US9321978	Mayfield Robert Nicholas (US)	**Fire kindler.** A fire kindler comprised of a comfortably portable geometrically shaped quartered plate of combustible material having a variable plurality of horizontal apertures therethrough which extract additional evolving gases into immediate combustion for extra heat and which operates in an elevated vertical position between two parallel logs so to present a common lower crest which bifurcates into a symmetric divergent communal acclivity of surfaces, which rise into opposite common divergent convergent junctions whereby symmetric surfaces rise convergently to terminate at vertical height in a common upper crest so that fire kindler is easy to ignite and will convergently and prominently direct combustion into a hotter and steadier solitary flame whereby potential heat is aimed at a localized area of any intended fuel placed above it. Thus, developing a hot spot on the firewood which increases entropy and rate of ignition.
BR202013019688	Mil Montagens Ind Los Ltda Me (BR)	**Device for burning biomass for heating liquids.** The device has a structure with a storage unit, where the storage unit is provided for feeding and transporting the biomass by a helical axis. The helical axis is horizontally aligned and packed in a tube. A lateral opening is provided at a lower compartment.

COMBUSTIÓN DIRECTA		
Nº Publicación	Solicitante (País)	Contenido técnico
US9353944	Poet Res Inc (US) et al.	**Combustion of high solids liquid.** A system for the combustion of high solids liquid to produce steam for the production of ethanol is disclosed. The system comprises a method for combusting high solids liquid. The method comprises supplying a stream of high solids liquid to a furnace; atomizing the stream of high solids liquid into the furnace; and distributing biomass fuel into the furnace. The stream of high solids liquid are combusted with the biomass fuel in the furnace.
WO2016062317	Proces Sander APS (DK)	**Multi-purpose furnace system.** The system has an opening for allowing exit gas to flow from primary and secondary combustion chambers into a heat transferring chamber. A resistance spiral unit is arranged in outflow channels, and provides resistance to exit gases flowing through the outflow channels and an exit gas chamber of an outflow pipe. Feasible units are arranged in heat transferring relationship with the outflow channels to utilize heat transferred to the heat transferring chamber, to produce electricity or warm water, and to furnish the heat to a heating circuit. USE : Multi-purpose furnace system e.g. wood burner, wood burning stove, open fireplace, furnace, stove, heath, and boiler for burning wood, biomass fuel, wood pellets, oil, coal, and coke (all claimed), for smaller scale domestic applications in a building.
US8201408	Sepulveda Jose A (US)	**Biomass (woodfuel) cogeneration powerplant.** A sustainable closed loop system with zero waste for cogeneration of electric and thermal energy using woodfuel from a closeby energy plantation of quick growing trees such as Gliricidia Sepium. In addition to the energy plantation sub-system, the system includes a biomass fuel preparing sub-system and a steam and power generation sub-system for use with a biological wastewater treatment sub-system. No chemicals are used for wastewater treatment
WO2016055973	Thermax Ltd (IN)	**Hybrid air heater.** A hybrid air heater is disclosed. The air heater comprises a first water-wall surrounding a furnace and a second water-wall defining a reversal chamber, for heating water by the hot flue gases conveyed therefrom. A shell containing at least one main heat exchanger is located above or in front of the first water-wall. The shell receives the heated water from the first water-wall and the second water-wall. The main heat exchanger containing a set of fire tubes for conveying the hot flue gases and a set of air tubes for conveying cold process air provide heated process air by extracting heat from the heated water and the hot flue gases. Hybrid air heater used for utilizing hot flue gases generated from combustion of fuels such as biomass, fossils or waste.
GB2533222	Xtralec Ltd (GB)	**Improved efficiency combustion apparatus.** The invention relates to a combustion apparatus, in particular a stove comprising a combustion vessel and a flue through which combustion gases are exhausted. The combustion vessel has one or more external walls and a first internal dividing wall to an interior side of which is provided a firebox, and to an exterior side of which is provided a cavity defined between said internal dividing wall and at least one of said external walls. The firebox has a flue outlet in fluid communication with the flue and a valve for selectively opening and closing the flue outlet. Within or at one end of the internal dividing wall is provided a supplementary vent aperture so that combustion gases can flow into the cavity, which is in turn also provided with a flue outlet, particularly when the firebox valve is partially or fully closed. The invention is characterised by providing the supplementary vent aperture and the cavity flue outlet towards first and second ends of the cavity respectively such that combustion gases are constrained to flow through the cavity from said first end toward said second end when the firebox valve is partially or fully closed and in so doing are reheated to some degree by virtue of the adjacency of the cavity and the firebox. In order to extract more energy from the re-heated combustion gases, and thus render the combustion apparatus more efficient, thermal energy extraction means is secured to at least one wall of the cavity adjacent which there is some flow of the combustion gases. Ideally, the thermal energy extraction means is either a plurality of thermoelectric generators (TEGs) or one or more conventional heat exchangers of a back-boiler arrangement.

PIRÓLISIS/GASIFICACIÓN		
Nº Publicación	Solicitante (País)	Contenido técnico
US2016145496	Anellotech Inc (US)	**Catalytic fast pyrolysis process.** The present invention provides an improved catalytic fast pyrolysis process for increased yield of useful and desirable products. The process comprises the steps of: a) feeding biomass, a specific catalyst composition and transport fluid to a catalytic fast pyrolysis process fluidized bed reactor maintained at reaction conditions to manufacture a raw fluid product stream, b) feeding the raw fluid product stream of step a) to a catalyst separation and stripping system to produce separated catalyst and a fluid product stream, c) feeding the fluid product stream of step b) to a vapor/liquid separation system to produce a liquid phase stream and a vapor phase stream comprising benzene, toluene and xylenes, d) feeding the vapor phase stream of step c) to a product recovery system to recover benzene, toluene and xylenes, and e) recycling at least a portion of the recovered toluene of step d); to the fluidized bed reactor of step a).
WO2016091835	Autark Energy GmbH (DE)	**Downdraft fixed-bed gasifier for generating a product gas from pourable biomass particles.** The invention relates to a downdraft fixed-bed gasifier for generating a product gas from pourable biomass particles, to a method for operating such a downdraft fixed-bed gasifier, to a method for starting such a downdraft fixed-bed gasifier, and to a method for shutting down such a downdraft fixed-bed gasifier. By supplying air through the bed of biomass particles in the tubular gasifier component, a uniform distribution of the air is produced. Hardly any temperature differences occur in the oxidation zone by virtue of the uniform distribution. As a result, even pyrloysis gases produced over the oxidation zone flow through the oxidation zone in a uniform manner. The uniformity of the gas and the air flows allows a product gas to be generated with low tar quantities. The oxidation zone is locally connected by means of a cross-sectional jump between the gasifier component and the gasifier container at the open end of the gasifier component, different flow speeds resulting from said cross-sectional jump. By expanding the cross-section, the flow speed is slowed compared to conventional fixed-bed gasifiers. The different flow speeds within and outside the tubular gasifier component virtually fix the oxidation zone in front of the open end of the tubular gasifier component. Another advantage of the expanded cross-section is that the pyrolysis gases are not delimited by a tube wall while flowing through the oxidation zone. The flow conditions on tube walls are not uniform, and thus the temperatures there are not uniformly high. When pyrolysis gas flows on the edge of a tube wall through the oxidation zone, as is the case in the prior art, the long-chain hydrocarbons are not completely broken down. Additional long-chain hydrocarbon compounds are broken down by virtue of the absence of the tube wall, thus leading to an improvement of the motor efficiency when using the product gas.
WO2016077694	Battelle Memorial Institute (US) et al.	**Condenser entry for pyrolysis gas.** Methods and apparatuses are provided for mitigating premature condensate deposition from pyrolysis gas and plugging of a condenser entry. For example, a method for mitigating premature condensation may include directing a pyrolysis vapor flow into a condenser and directing the pyrolysis vapor flow away from a condensable surface prior to the condenser using a non-condensable gas flow. The non-condensable gas flow may be effective to mitigate premature condensation of pyrolysis products from the pyrolysis vapor flow onto the condensable surface. Additionally or alternatively, the method may include heating the noncondensable gas flow to heat a priorily condensable surface to a desired temperature, e.g., to provide a heated surface. The desired temperature may be greater than a condensing temperature effective to mitigate condensation of pyrolysis products from the pyrolysis vapor flow onto the heated surface.
WO2016071208	BDI Bioenergy Internat AG (AT)	**Method for the conversion of biomass to liquid and/or gaseous energy carriers.** The invention relates to a method for the pyrolysis of hydrocarbon-containing solid biomass for the obtention of liquid and/or gaseous energy carriers in the presence of a heat carrier, in which a mixture of the heat carrier and the biomass is heated up to the pyrolysis of the biomass. The method according to the invention is characterized in that the biomass is impregnated with a volatile, non-aqueous liquid before the mixture with the heat carrier.

PIRÓLISIS/GASIFICACIÓN		
Nº Publicación	Solicitante (País)	Contenido técnico
FR3027311	Commissariat Energie Atomique (FR)	**Method and device for pyro-gasification of a carbonaceous material including a bath of molten ash.** Transforming carbonaceous material to synthetic gas material involves subjecting carbonaceous material to pyrolysis and gasification. The pyro-gasified carbonaceous material ashes are fused with gasifying agent to obtain synthetic gas. The carbonaceous material is selected from agricultural productions, agricultural residue, forest productions, forest productions and agricultural residues obtained from breeding and organic waste.
WO2016071808	Degremont (FR)	**Method for the hydrothermal carbonisation of a biomass and associated device.** The invention relates to a method for heating a biomass moving along an industrial treatment line comprising an inlet for the incoming biomass, a heating means, and a treatment station. According to the invention, a fraction of the biomass heated by the heating means is returned along a return branch (R) to a mixing station upstream of the heating means so as to form, together with the incoming biomass, a mixture having a temperature above the temperature of the incoming biomass, the heated biomass fraction being removed at an outlet of the treatment station.
EP3031884	Electricité de France (FR) et al.	**Method for gasifying a load of carbonaceous material with optimised material yield and production cost.** The invention relates to a thermochemical process for converting a carbonaceous feedstock in a synthesis gas to produce a fuel or a fuel or another product of interest, comprising an intermediate step to choose one of the three intermediate steps a) to c) the following :; a / upstream of the decarbonation step, is subjected to the synthesis gas, a step of reacting the gas with water (WGS) or b / downstream of the gas purification step, is added the synthesis gas, hydrogen produced by electrolysis of water, or c / downstream of the gas purification step, is subjected to a mixture of synthesis gas and hydrogen produced by electrolysis of water, a step of reacting the gas return water (RWGS), the choice of one or other of the steps a / c / is carried out depending on the cost of electricity required to produce hydrogen by electrolysis of water.
RU2582132	Federalnoe G Bjudzhetnoe Uchrezhdenie Nauki Inst Khim I Khim T Sib Otdel Rossijskoj Akademii Nauk Ik (RU)	**Method for producing activated carbon.** Invention relates to chemical processing of wood, in particular to a method of producing microporous carbon sorbents. Method of producing activated charcoal involves mixing milled initial or preliminary heat treated at 280-350 DEG C birch bark with potassium hydroxide, taken either in solid form or in form of a solution, carbonisation at 600-800 DEG C in argon atmosphere, washing obtained product to neutral pH and drying.EFFECT: technical result is improved sorption properties of carbon sorbent from birch bark due to improved microstructure.1 cl, 8 ex, 1 tb
US2016138428	Gen Electric (US)	**System and method for heat recovery and steam generation in combined cycle systems.** A system includes a heat recovery steam generator (HRSG) including a first pressure economizer, a first pressure evaporator that may receive a first portion of a feed water from the first pressure economizer at a first pressure, a re-heat section that may receive the first portion of the feed water from the first pressure economizer as a first steam flow, and a flash system including a first flash vessel that may receive a second portion of the feed water from the first pressure economizer and to generate a first flash steam flow. The system may combine the first flash steam flow with the first steam flow of the feed water at a second pressure less than the first pressure.
RU2579285	Jarygin Leonid Anatolevich (RU) et al.	**Gasifier of the reversed gasification process.** Invention relates to a device for thermal processing of the solid fuel into a combustible gas, and is intended for the production of producer gas from lignite, peat and wood resin. In describing the disclosed structural components of the gas generator facing the gasification process. Given their relative position, geometric design and implementation of communication between them.EFFECT: when using the present invention provides improved performance of the generator.

PIRÓLISIS/GASIFICACIÓN		
Nº Publicación	Solicitante (País)	Contenido técnico
ES2553679	Madison Solutions SL (ES)	**Planta y proceso para la producción de gasóleo a partir de residuos industriales y urbanos.** La presente invención se refiere a una planta para la producción de gasóleo a partir de la pirólisis de residuos industriales y urbanos, la cual comprende, sensores e instrumentos de medición e instalaciones de control de los equipos y al menos una red neuronal artificial (RNA) y se refiere también a un proceso de producción de gasóleo en dicha planta, el cual está controlado por RNA; y comprende el registro de los valores de entrada y salida de las etapas operativas del proceso, el entrenamiento y validación de las RNA, que una vez ejecutadas reajustan las variables de las etapas operativas del proceso hasta conseguir un proceso completamente controlado y optimizado.
US2016137939	Seidner Marc (US) et al.	**Green Renewable Liquid Fuel.** A liquid fuel derived from processed biomass having extremely low water content and suitable for use in diesel engines or as an additive to petroleum based fuels, or which can be used as a petroleum or coal slurry substitute in those uses where a lower cost fuel have reduced emission is desired, is described.
WO2016075362	Teknologian Tutkimuskeskus VTT Oy (FI)	**Method And Apparatus For Gasifying Raw Material And Gaseous Product.** The invention relates to a method and apparatus for gasifying raw material. According to the invention, the method comprises feeding the raw material into an upper part of a fixed-bed gasifier, introducing the raw material from the upper part of the gasifier to a pyrolysis zone of the gasifier to form the fixed-bed in the pyrolysis zone and pyrolyzing the raw material in the presence of pyrolysis air in the pyrolysis zone to form a pyrolysis product, introducing the pyrolysis product from the pyroly- sis zone to a lower part of the gasifier, introducing primary air countercurrently to the lower part, carrying out a final gasification in a lower part of the gasifier in order to form a gasified gas, introducing the gasified gas to a catalytic oxidation part and through a catalyst layer of the catalytic oxidation part, and reforming the gasified gas by means of the catalytic oxidation in the presence of reforming air in the catalytic oxidation part, in order to form a gaseous product. Further, the invention relates to a gaseous product.
BR102013022203	Univ Fundacao Brasilia (BR)	**Producing light hydrocarbons by catalytic cracking.** Producing light hydrocarbons by catalytic cracking using bio oil obtained from pyrolysis of fatty vegetable or animal waste, as starting material and zeolite in nanocrystalline form as catalyst, comprises: adding nanocrystalline zeolite catalyst in reactor with heating system; thermally treating the catalyst; adding the bio oil into the reactor; subjecting to heating; and cooling the reaction mixture.
WO2016072932	Univ Singapore (SG)	**Activated carbon, hydrochar and processes for making same.** Activated carbon, hydrochar and processes for making the same are provided. The process for making hydrochar and activated carbon includes providing a biomass and mixing the biomass with an oxidizing agent to form a biomass-oxidizing agent mixture. The biomass-oxidizing agent mixture is subjected to a hydrothermal carbonization process to form a hydrochar having an increased oxygenated functional group content compared to that of the biomass. The hydrochar is mixed with an activating agent to form a hydrochar-activating agent mixture. The hydrochar-activating agent mixture is subjected to a chemical activation process to form an activated carbon.

TECNOLOGÍAS BIOQUÍMICAS
Patentes

DIGESTIÓN ANAERÓBICA		
Nº Publicación	Solicitante (País)	Contenido técnico
ES2555358	Acciona Agua S A U (ES)	**Biological pretreatment of biodegradable organic material prior to anaerobic hydrolysis, comprises subjecting aqueous stream of organic material to culture of organisms generating hydrolytic enzymes without external supply of nutrients.** Biological pretreatment of biodegradable organic material prior to process of anaerobic hydrolysis, comprises subjecting an aqueous stream containing 0.1-100 g/l of total volume of organic material to culture of organisms generating hydrolytic enzymes with stirring without external supply of nutrients for a hydraulic retention time of 24-48 hours and in mesophilic condition at 25-45° C or thermophilic condition at 45-65° C, where the organic material is from a substrate in which organisms are grown for enrichment in aqueous stream, before subjecting to anaerobic hydrolysis.
DE102014222703	Bue Anlagentechnik GmbH et al. (DE)	**Method for performing desulfurization of biogas in biogas fermenter, involves flowing biogas formed by fermentation by recording system through support portions, and introducing air into biogas fermenter.** The method involves arranging a recording system with biodegradable support portions during the anaerobic fermentation of biomass in a biogas fermenter in a gas space above a substrate chamber. The biodegradable support portions are vaccinated with hydrogen sulfide-degrading microorganisms. The biogas formed by the fermentation by the recording system is flown through the support portions, and is desulfurized by the microorganisms. The air is introduced into the biogas fermenter.
GB2529804	C Tech Innovation Ltd (GB)	**Method of pre-treating a feedstock for anaerobic digestion.** A method of pre-treating a feedstock intended for anaerobic digestion, the method comprising: (1) providing an organic waste at a temperature of from 80 to 200 Â DEG C and a first pressure of greater than 1 bar; and (2) flash evaporating volatiles from the organic waste by reducing the pressure of the organic waste from the first pressure to a second pressure lower than the first pressure. Suitably, the organic waste comprises animal waste, such as intestinal waste and/or bacterial contaminated tissue. One or more of water soluble inorganic salts, water soluble organic salts and water soluble nitrogen-containing compounds may be added to the organic waste prior to step (2). A method of producing biogas is also claimed which comprises pre-treatment of a feedstock as described above; and passing the feedstock to an anaerobic digester to produce biogas. In another aspect, a feedstock for anaerobic digestion is claimed, wherein the feedstock is in a liquid state and has a total viable count (TCG) according to ISO 4833-1:2013 of less than 5, the feedstock being obtainable according to the method described above.
BR102014009156	Da Silva Neto J V (BR)	**Method for producing e.g. bioenergy, through anaerobic digestion and microalgae farming, involves operating thermoelectric plant biogas and solid-liquid separation systems in certain periods during harvesting sugarcane.** The method involves producing biogas from complex organic compounds and biomass by using anaerobic reactors. A biogas conditioning system is utilized for performing desulphurization process based on high levels of stillage sulfate. A series of reactors are utilized for producing algae. A thermoelectric plant biogas, solid-liquid separation systems, exhaust gas recycling systems and inoculum preparation systems are operated in certain periods during harvesting sugarcane and producing bio-fertilizer, biogas and electricity.
WO2016050893	Dong Energy Thermal Power AS (DK)	**Methods and bioreactors for microbial digestion using immobilized biofilms.** The invention relates to methods, devices and inserts for reactors for microbial and anaerobic digestion. In particular, the invention relates to reactors comprising inserts for biofilms, such as methane-producing biofilms, immobilized on a carrier matrix. The flexibility towards substrate variations is achieved. The suspended particles precipitated in the sedimentation zones of the backflow mixing are ensured. The energy usage or electrical consumption is minimized though the use of the insert. The splashing mixing effect is achieved simply by forcing the fluid flow into the volume to change the direction of vertical flow.

DIGESTIÓN ANAERÓBICA

Nº Publicación	Solicitante (País)	Contenido técnico
PL409256	Inst Agrofizyki im Bohdana Dobrzanskiego Polskiej Akademii Nauk (PL)	**Sonication-based pretreatment of lignocellulosic biomass for shortening duration of anaerobic digestion involves using sonication to break up long chains of lignocellulose in the biomass plant, particularly grass silage.** A lignocellulosic biomass is pretreated by using sonication to break up long chains of lignocellulose in the biomass plant, particularly grass silage, in which cellulose content is ↗ 50% and lignin content is ↗ 20%. The method allows to observe a clear change in the structure of the lignocellulosic biomass to shorten the duration of anaerobic digestion.
WO2016035953	Kf Co Ltd (KR)	**Biogas purification system.** Bio-gas refining system for use in landfill for refining bio-gas utilized as fuel of vehicle i.e. armored motorcar, has an inertial impaction type heat exchanger for removing moisture and fine dust included in landfill gas. A hydrogen sulfide/siloxane removing apparatus removes siloxane and hydrogen sulfide of the landfill gas. A high concentration hydrogen sulfide removing apparatus controls concentration of the hydrogen sulfide of the landfill gas by using iron catalyst. The high concentration hydrogen sulfide removing apparatus is fixed to the heat exchanger A flow route formation part is formed with a gas moving pathway for making flow of moisture laden gas.
WO2016049574	Ovivo Inc (CA) et al.	**Digestion of waste activated sludge with algae.** Method for effecting efficient digestion of waste activated sludge (WAS) in a wastewater treatment plant, involves (a) introducing phagotrophic algae to WAS, to produce a WAS-algae mixture, (b) subjecting WAS-algae mixture to digestive conditions in a digestion process, (c) maintaining the WAS-algae mixture in digestion process for period of time that preselected volatile solids (VS), sour and pathogen targets met in digested mixture, and (d) removing resulting digested biomass from digestion process.
DE102014013777	Rogmans Maria (DE)	**Method for operating a biogas plant.** Operating a biogas plant, comprises: fermenting or post-fermenting agricultural manure, fermentation pulp which has already been partially gassed in a previous fermentation, sewage sludge and/or waste from food production as a fermentation substrate, where agricultural manure, fermentation pulp, partially gassed fermentation pulp, sewage sludge and/or waste from food production of material mixture; and additionally adding iron hydroxide, pH regulator, zeolite and/or hydrolyzed residue from the food or edible oil production, and/or enzymes, minerals, milled active- and/or charcoal mixture.
US2016130166	Seab Energy Holdings Ltd (GB)	**Renewable energy microgeneration system.** A portable renewable energy microgeneration system is disclosed. The system comprises one or more holding tanks that are configured to perform anaerobic digestion on waste in a multi-phase process using bacteria, an odor management system that is configured to remove odors from gas generated during anaerobic digestion, and a controller configured to automatically control the multi-phase process and to re-use the bacteria. The controller re-uses the bacteria by removing at least a portion of the liquid from the waste after anaerobic digestion is performed on the waste and using the at least a portion of the liquid to wet other waste and repeat the multi-phase process.
US2016138048	UChicago Argonne LLC (US)	**Method for generating methane from a carbonaceous feedstock.** The present invention provides a method for generating methane from a carbonaceous feedstock with simultaneous in situ sequestration of carbon dioxide to afford a biogas comprising at least 85 percent by volume methane, the method comprising anaerobically incubating a particulate additive in contact with a carbonaceous feedstock in a neutral or alkaline aqueous culture medium containing a culture of methanogenic consortia and collecting methane generated therefrom. The additive comprises at least one material selected from a biochar, an ash produced by gasification or combustion of a carbonaceous material, a black carbon soil, and a Terra Preta soil.

FERMENTACIÓN DE AZÚCARES

Nº Publicación	Solicitante (País)	Contenido técnico
RU2581799	AS Sibe Chem Power Technologies Inst (RU)	**Method of producing bioethanol from lignocellulose material.** Method of producing bioethanol from lignocellulose material involves preliminary processing of raw material at atmospheric pressure, combination of steps enzymatic hydrolysis and alcohol fermentation, extraction of bio-ethanol from brew. At that, preliminary processing of raw material with moisture content of 12-60 % is carried out at atmospheric pressure with diluted acid with concentration of 4-10 % at 94-96 °C with subsequent treatment with sodium hydroxide solution with concentration of 3-6 % at 94-96 °C. Enzymatic hydrolysis is carried out at pH 4.0-6.5 at temperature 30-65 °C. Material used is renewable lignocellulose material: straw, fruit shell cereal and oil crops, silver grass, pulp and cake of crops. Invention provides output of bio-ethanol from 1 t of raw material equal to 8.5-20.5 dal.
WO2016070258	Biocelere Agroindustrial Ltda (BR)	**Expression cartridge for the transformation of eukaryotic cells, genetically modified micro-organism with efficient xylose consumption, method for producing biofuels and/or biochemicals, and thus produced biofuel and/or biochemical and/or ethanol.** The present invention provides technical solutions for the production of second generation fuels based on plant biomass conversion, for example from cell wall polymers. The present invention describes, inter alia, a genetically modified micro-organism with efficient fermentation performance when converting sugars present in plant biomass into biochemicals and/or biofuels, and with efficient resistance to the inhibitors generated during the biomass processing steps leading to the production of sugars, in particular acetic acid, thus improving its performance on an industrial scale. The present invention also relates to the method for producing biofuels and/or biochemicals using the micro-organism described in the present document, and to the thus obtained biofuels and/or biochemicals and products.
WO2016054176	Danisco Us Inc (US)	**Compositions comprising beta-mannanase and methods of use.** New recombinant Streptococcus gallolyticus glycosyl hydrolase polypeptide having beta mannanase activity, useful for hydrolyzing lignocellulosic biomass substrate containing galactoglucomannan to yield glucose and other sugars.
WO2016051166	Hartley Brian Selby (GB)	**Device useful for selecting microbial strains, preferably Geobacillus useful in bioethanol production from agricultural feedstocks, has several fermenter compartments for culturing microbial cells.** Device for selecting microbial strains, has several fermenter compartments for culturing microbial cells, where the fermenter compartments are linked to provide series of fermenter compartments in fluid connection for successively transferring microbial cells through each fermenter compartment in the series, and the fermenter compartment has volume of about 5 µ l-200 ml.
MX2014003304	Inst Potosino de Investigación Científica y Tecnológica A C (MX)	**Process for the simultaneous production of bio-hydrogen and bioethanol using lignocellulose hydrolyzates as a substrate.** Producing biohydrogen and bioethanol involves preparing substrate, where has 0.66-2.34wt.% lignocellulosic substrate culture medium and sugars (pentoses and hexoses) from substrate. The Escherichia colistrain has deletion gene hycA. The fermenting mixture of anaerobic process is obtained in single step. The process is carried out in pH range of 4.8 to 8.2.
WO2016063709	Japan Int Res Ct For Agricultural Sciences (JP)	**Method of using palm trunks.** The present invention provides a method by which, at a stage prior to storing felled palm trunks, palm trunks in which the sugar concentration could increase can be efficiently selected and, as a result of storing the selected palm trunks, sap that contains sugar can be efficiently collected. Provided is a method of using palm trunks, the method including: a starch confirmation step for confirming the amount of starch present in a palm trunk; a felled palm trunk storage step for storing, for a certain period of time, palm trunks for which the amount of starch present therein has been confirmed in the starch confirmation step; and a sap collection step for collecting sap from the stored palm trunks, following the felled palm trunk storage step. The method further involves performing fermentation or sugar liquid conversion process for fermenting palm trunk or sugar liquid extract by reacting with enzyme or microorganisms.

FERMENTACIÓN DE AZÚCARES

Nº Publicación	Solicitante (País)	Contenido técnico
US2016130620	Korea Inst Sci & Tech (KR)	**Biocatalyst for simultaneously degrading lignin and cellulose, and method for manufacturing hydrolysate and biofuel using the same.** The present disclosure relates to a method for simultaneously degrading lignin and cellulose and for boosting effect on the cellulase activity using a specific catalyst. Since the present disclosure allows for the preparation of sugars by degrading not only lignin but also cellulose and hemicellulose using the enzymes which were previously known only as lignin-degrading biocatalysts, it provides the advantage that the preparation of a hydrolysate as a source material for the production of biofuels or biochemicals from lignocellulosic biomass can be simplified and facilitated. As a result, the present disclosure can reduce enzyme cost and can provide improved production efficiency by simplifying the biofuel production process.
US2016090405	L Livermore Nat Security LlC (US)	**New ionic liquid resistant recombinant microorganism comprising heterologous gene encoding e.g. yeast major facilitator superfamily polypeptide, useful for increasing yield of reaction utilizing soluble sugars as carbon source, e.g. fermentation reaction that produces e.g. biofuel.** A recombinant microorganism having resistance to ionic liquids, is new. The microorganism comprises a heterologous gene encoding a yeast major facilitator superfamily (MFS), or a SalmonellaMFS SmvA pump or SmvR regulator polypeptide operably linked to a promoter, where polypeptide has at least 70% identity to a 495, 213, or 544 amino acid sequence (SEQ ID NO: 1, 2 or 21) fully defined in the specification.
WO2016045569	Novozymes AS (DK)	**Processes for producing ethanol and fermenting organisms.** Method for producing ethanol, involves (a) saccharifying a cellulosic material with a cellulolytic enzyme composition and (b) fermenting the saccharified cellulosic material with a fermenting microorganism to produce the fermentation product, where the fermenting organism is Saccharomyces cerevisiaestrain CIBTS1260 (NRRL Y-50973), or a fermenting organism having properties similar to S.cerevisiaestrain CIBTS1260.
US2016122785	Toyota Motor Co Ltd (JP)	**Method of producing ethanol using continuous culture and continuous culture apparatus.** A method of producing ethanol includes: measuring a xylose concentration in a culture fluid that contains microorganisms having xylose utilizing ability, the culture fluid including a culture medium that contains saccharides derived from lignocellulose; and performing an addition control in which an additional culture medium is added to the culture fluid to conduct a continuous culture of the microorganisms, the additional culture medium containing saccharides derived from lignocellulose.
ES255270	Univ Cadiz, Univ Jaén (ES)	**Converting dry Posidonia oceanica to produce second generation bioethanol.** Converting dry Posidonia oceanicato produce second generation bioethanol, comprises: mechanical pretreatment by crushing fibers, to reduce its size; thermal pretreatment in the presence of nitrogen at 150° C, pressure of 1 bar for 30 minutes, without using a chemical agent ; simultaneous saccharification and fermentation by using an enzyme mixture with endocelullase and exocellulase activities (β -glucosidase) and also xylanases activites, and inoculating with reaction medium comprising yeast e.g. Saccharomyces cerevisiae; and liquid or vapor distillation.
WO2016062821	Universität Frankfurt et al. (DE)	**Variants of GAL2 transporter and their uses.** The present invention relates to polypeptides which are Gal2 variants comprising at least one amino acid substitution at a position corresponding to M435, and optionally further amino acid substitution(s). The present invention further relates to nucleic acid molecules encoding the polypeptides and to host cells containing said nucleic acid molecules. The present invention further relates to a method for the production of bioethanol and/or other bio-based compounds, comprising the expression of said nucleic acid molecules, preferably in said host cells. The present invention also relates to the use of the polypeptides, nucleic acids molecule or host cells for the production of bioethanol and/or other bio-based compounds, and/or for the recombinant fermentation of biomaterial containing pentose(s), preferably D-xylose and/or L-arabinose.

FERMENTACIÓN DE AZÚCARES		
Nº Publicación	Solicitante (País)	Contenido técnico
US2016068869	Wisconsin Alumni Res Found (US)	**Recombinant yeast having enhanced gamma valerolactone tolerance and methods of use.** The present invention relates to materials and methods for the production of ethanol. More particularly, the present invention provides genetically modified strains of Saccharomyces cerevisiae having enhanced tolerance for gamma valerolactone (GVL) toxicity. Also provided are methods of using such genetically engineered yeast strains for improved GVL-mediated hydrolysis of lignocellulosic biomass for industrial-scale ethanol production.

TECNOLOGÍAS QUÍMICAS
Patentes

Nº Publicación	Solicitante (País)	Contenido técnico
US2016102041	Crystaphase Products Inc (US)	**Heterogeneous catalyst for transesterification and method of preparing same.** A transesterification catalyst that is heterogeneous and a method for preparing said transesterification catalyst are provided. The catalyst can be used in a variety of transesterification reactor configurations including CSTR (continuous stirred tank reactors), ebullated (or ebullating) beds or any other fluidized bed reactors, and PFR (plug flow, fixed bed reactors). The catalyst can be used for manufacturing commercial grade biodiesel, biolubricants and glycerin.
WO2016054597	Flint Hills Resources LP (US)	**System and methods for making bioproducts.** Processes and system for producing biofuels and coproducts are described herein. The processes include pretreating a feedstock comprising fatty acid glycerides and free fatty acids to remove contaminants, contacting the feedstock with alcohols and a solid acidic catalyst to produce a biofuel comprising fatty acid alkyl esters, and purifying the biofuel and coproducts from the resulting reaction mixture.
BR102013029552	Glycerosolution Química Ltda (BR)	**Producing triglycerides and glycerides of low acidity containing specific amounts of glycerol used as primary reagent for producing biodiesel and industrial esters, involves utilizing triglycerides and glycerides as raw material.**
RO131043	Inst National De Cercetare Dezvoltare Pentru Tehnologii Izotopice Si Moleculare (RO)	**Cold plasma reactor for preparing biodiesel fuel.** The invention relates to a cold plasma reactor for biodiesel fuel preparation, employed in the transesterification of vegetable oils, based on a reaction assisted by the effects of high-frequency cold plasma while not requiring the use of chemical catalyst-type substances. According to the invention, the reactor comprises a quartz cylinder having mounted, at each of its both ends, a cap made of a dielectric material, where the upper cap serves for the intake of the primary mixture, vegetable oil and methanol, and the radial distribution thereof onto the internal wall of the cylinder and, due to gravity, the so distributed mixture flows towards the lower cap of the reactor, passing through the reaction zone covered by the cold plasma and then, at the lower part of the cap (10), the mixture is collected through an orifice, the cold plasma being primed between an internal electrode and an external electrode, the current passing through the two tubes of dielectric material, the electrode being connected to the ground of the high-voltage source, while the electrode is connected to the output of the high-voltage source in the marked point, the reactor electrode being made of a quartz tube having a wall thickness of 1...1.5 mm, which contains inside a cylinder made of sheet metal or wire gauze and the tube being mounted on a rotary shaft of the reactor by means of some fastening pieces made of dielectric material, to form a rotary electrode or a rotor, the shaft being mounted to the lower and upper caps of the reactor by means of some shielded ball bearings and the rotor being driven by an electric motor, by means of a gin; made of dielectric material, the rotor speed being in the range of 60...90 rpm and the distance between the external wall of the tube and the internal wall of the tube being adjusted at 1.5...2 mm.

Nº Publicación	Solicitante (País)	Contenido técnico
ES2564249	Respsol SA (ES)	**Compositions and methods for biofuel production.** New Pseudomonas brassicacearum microorganism strain CECT-8162 capable of accumulating specified amount of lipids used for obtaining triglyceride rich microbial biomass i.e. used to obtain lipid composition, microbial biomass and biodiesel.
BR102013000118	Servico Nac De Aprendizagem Ind -Senai DR BA (BR)	**Transforming triglycerides into fatty acids, involves taking triacylglycerides, monoalcohol, catalyst and sodium chloride to undergo transesterification reaction, and then separating formed phases.** The method provides fatty acids in a simple and cost-effective manner by carrying out transesterification reaction in an open system under moderate temperature conditions. The obtained fatty acid improves characteristics and lubricity of the fuel and reduces pollution.
US2016152905	Sundrop Fuels Inc (US)	**Biomass to transportation fuels using a Fischer-Tropsch process.** An integrated plant to generate chemical grade syngas from a steam biomass reforming in a multiple stage bio reforming reactor for use with either a high temperature or low temperature Fischer-Tropsch synthesis process to produce fuel from biomass is discussed. The first stage has a reactor to cause a chemical devolatilization of a biomass feedstock from the biomass feedstock supply lines into its constituent gases of CO, H2, CO2, CH4, tars, chars, and other components into a raw syngas mixture. A second stage performs further reforming of the raw syngas from the first stage into the chemical grade syngas by further applying heat and pressure to chemically crack at least the tars, reform the CH4, or a combination of both, into their corresponding syngas molecules. The second stage feeds the chemical grade syngas derived from the biomass feedstock to the downstream Fischer-Tropsch train to produce the fuel from the biomass. One or more recycle loops supply tail gas or FT product back into the plant.
US2016152924	Technochem (US)	**Process for converting low and high free fatty acid containing oils into no free fatty acid containing oils and associated systems and devices.** The disclosed apparatus, systems and methods relate to the conversion of high free fatty acid ("HFFA") containing oils defined as oils containing 20-100% free fatty acids ("FFA") and low free fatty acid ("LFFA") containing oils defined as oils containing 1-20% free fatty acids (FFA) into oil with less than about 0.5-1% FFA. If the feedstock is HFFA oil, the process includes a combination of partial glycerolysis of HFFA oils to produce LFFA oils and subsequent stripping of LFFA oils to produce NFFA oils via steam distillation. If the feedstock is LFFA oil, the process includes stripping of LFFA oils to produce NFFA oils via steam distillation and subjecting FFA to partial glycerolysis to convert FFA to oil.
BRPI1010482	Univ Fed de Alagoas Ufal (BR)	**Process for producing biodiesel using castor lipase as catalyst without the need for extraction and purification of the enzyme.** The present invention relates to an alternative process for biodiesel production, for use as a fuel or fuel additive. More specifically, the present invention relates to a biodiesel production process by transesterification, where pre-processed castor seeds are placed in contact with an alcohol in a specific pH, to produce biodiesel, without the need for added catalyst as since the very acidic lipase present in castor seed acts as sole catalyst, without the need for extraction and enzyme purification.
BR102014014143	Univ Fed de Pelotas (BR)	**Reactor for the synthesis of biodiesel.** Reactor for synthesizing biodiesel, comprises unit for carrying out esterification and transesterification of methyl and ethyl at 5-80° C to obtain biodiesel. The reactor is small, easy to transport and has low energy consumption.
US9328035	Univ South Florida et al. (US)	**Systems and methods for producing liquid hydrocarbon fuels.** In one embodiment, liquid hydrocarbon fuels are produced in a single reactor using a hybrid catalyst system including a reforming catalyst, a Fischer-Tropsch synthesis (FTS) catalyst, and a porous material that spatially separates the reforming catalyst from the FTS catalyst.

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VT BIOMASA PATENTES

Boletín elaborado con la colaboración de :

MINECO
c/Albacete, 5
28027 Madrid
Tel: 91 603 83 18
E-mail: consultas.sgecpp@mineco.es
www.mineco.es

OEPM
Paseo de la Castellana, 75
28071 Madrid
Tel: 91 349 53 00
E-mail:carmen.toledo@oepm.es
www.oepm.es

Bioplat
C/ Dr. Castelo 10, 3ºC-D
28009 Madrid
Tel.: 91 307 17 61
E-mail: secretaria@bioplat.org
www.bioplat.org

CIEMAT
Avda. Complutense,40
28040 Madrid
Tel: 91 346 08 99
E-mail:mjose.cuesta@ciemat.es
www.ciemat.es