



## BIOMASA FORESTAL: PUBLICACIONES CIENTÍFICAS EN EUROPA EN 2016

La valorización energética de biomasa está siendo fuertemente impulsada en los últimos años por la legislación europea con el fin de alcanzar los objetivos energéticos y de cambio climático establecidos para 2020 y años posteriores. La biomasa forestal representa una fuente potencial enorme de biomasa lignocelulósica de bajo coste capaz de producir bioenergía en forma de calor/frío, electricidad y biocombustibles líquidos para el transporte. Actualmente, su uso a gran escala se restringe al de producción de calor/frío y electricidad, siendo marginal la de generación de biocombustibles como el bioetanol. Esto se debe a una serie de limitaciones económicas y técnicas derivadas, fundamentalmente, de la estructura recalcitrante de este tipo de materiales ricos en lignina y que dificultan las etapas de pretratamiento e hidrólisis enzimática del proceso de fermentación alcohólica. Estas etapas están siendo objeto de intensa investigación en nuestros días.

A continuación, con el fin de obtener una visión actual del panorama de investigación europea en este ámbito, se va a proceder a realizar un breve análisis bibliométrico de los artículos científicos publicados por instituciones europeas en el año 2016, utilizando como fuente la colección principal de Web of Science.

Hasta la fecha se han publicado en el mundo más de 9000 artículos relativos al aprovechamiento energético de biomasa forestal. Los primeros datan de comienzos de la década de los 80, produciéndose desde entonces un crecimiento moderado hasta llegar a 2006. Desde ese año, el crecimiento ha sido espectacular, de modo que en los diez últimos años se han publicado el 83% del total.

Los países líderes a nivel mundial son EE.UU., China, Canadá, Suecia y Japón. A ellos les corresponde el 18,7%, 12,2%, 8,1%, 6,6% y 5,9% de las publicaciones, respectivamente. Tras ellos se sitúan Finlandia, España, Alemania, Italia y la India, con el 5,3%, 5,2%, 4,1%, 3,5% y 3,4%, respectivamente. Como se puede observar, entre los top ten se sitúan cinco países europeos.

Si se restringe el análisis al año 2016, en que se superaron las 500 publicaciones, cabe destacar que en el 46% participaron instituciones europeas. Suecia, Italia y España son los países europeos situados a la cabeza ese año, con el 12,1%, 11,7% y 10,9% de las publicaciones europeas, respectivamente (Figura 1). Existen más de cien instituciones europeas con algún artículo publicado en 2016. Aquéllas con más de cinco (contribución >1% del total europeo) se recogen en la Figura 2. Las que ocupan una posición de liderazgo son la Swedish University of Agricultural Sciences (Suecia), el Centre National de la Recherche Scientifique (CNRS, Francia), el Consejo Superior de Investigaciones Científicas (CSIC, España) y la Luleå University of Technology (Suecia), a las que corresponde el 3%, 2,8%, 2,6% y 2,6% de las publicaciones, respectivamente.

En relación al área al que se dirigen las investigaciones en Europa en 2016, cabe señalar que en el 83% de las publicaciones se abordan los distintos tipos de tratamiento, termoquímico o bioquímico fundamentalmente, a que se somete la biomasa forestal, mientras que en el 17% restante se tratan otros temas tales como análisis de ciclo de vida, almacenamiento, características y disponibilidad de los materiales de partida, revisiones bibliográficas, etc.

Cabe destacar que los artículos sobre pirólisis/gasificación son los más numerosos (45% del total), seguidos de los referidos a combustión (23%), fermentación alcohólica (12%) y digestión anaeróbica (3%) de la biomasa forestal (Figura 3).

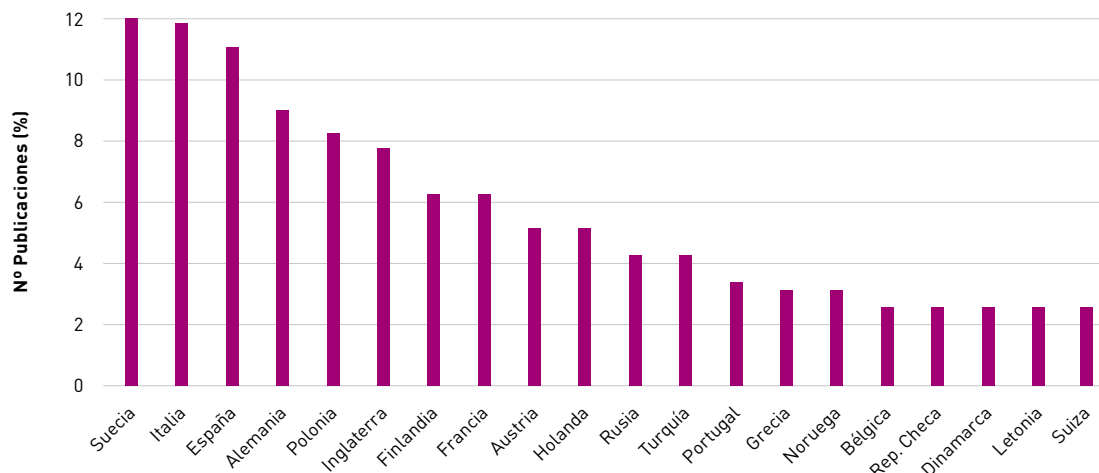


Figura 1. Países europeos con artículos publicados en 2016 (contribución >2% del total europeo)

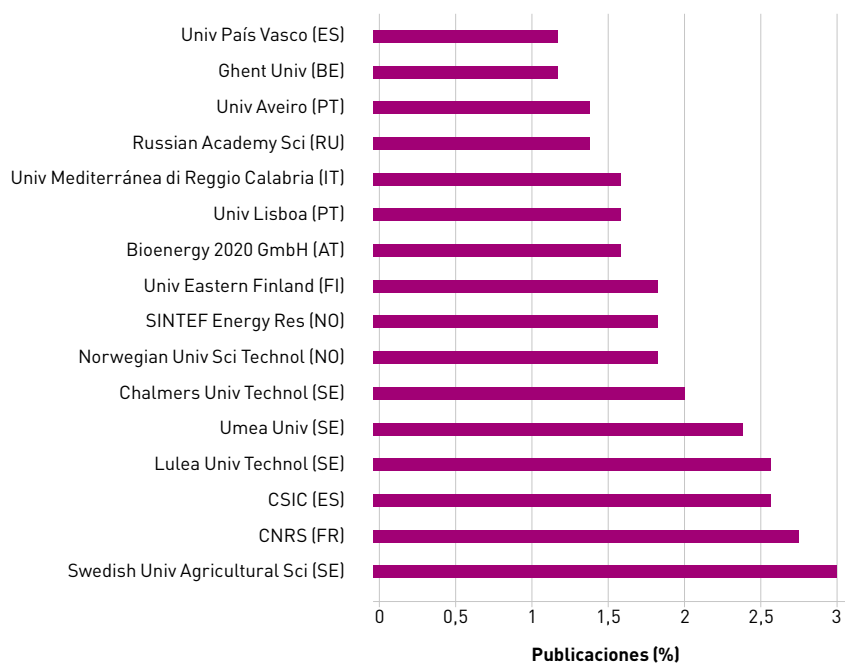


Figura 2. Instituciones europeas líderes en publicaciones en 2016

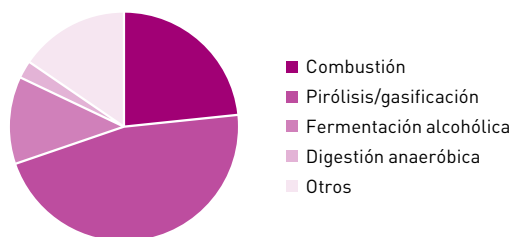


Figura 3. Distribución de las publicaciones europeas de 2016 por su área de investigación

# ANÁLISIS DE PATENTES

Durante el primer trimestre de 2017 se han identificado en la base de datos WPI (World Patent Index) 1691 familias de patentes sobre tecnologías de conversión de la biomasa para la producción de energía. La mayoría de las referencias corresponde a invenciones para las que solamente se solicita protección en países asiáticos (Tabla 2). 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 cuenta esta consideración, cabe señalar que el 76.6% de las familias se refiere a las tecnologías termoquímicas. El 21.4% y el 7.1% hacen referencia a las tecnologías bioquímicas y químicas, respectivamente. La tecnología de combustión es la que cuenta con mayor número de resultados, 40.5% del total, seguida de la de pirólisis/gasificación, con el 37.7%.

Tipos de tecnologías de conversión de la biomasa	Nº Familias (Todos los ámbitos de protección)	Nº Familias (Excluidas aquéllas con ámbitos de protección exclusivamente asiáticos)
Tecnologías termoquímicas	1126	150
Combustión directa	497	75
Gasificación/pirólisis	655	77
Tecnologías bioquímicas	171	44
Digestión anaeróbica	118	20
Fermentación de azúcares	54	25
Tecnologías químicas (transesterificación, Fischer-Tropsch, síntesis de metanol)	69	14
<b>Nº TOTAL FAMILIAS DE PATENTES</b>	<b>1342</b>	<b>197</b>

**Nota:** alguna invención puede incluirse en más de una tecnología

**Tabla 2.** Número de familias de patentes clasificados por tecnologías

En la Tabla 3 se muestran los países líderes en protección. En primer lugar se encuentran las solicitudes internacionales (PCT), con 90 documentos; en segundo lugar se encuentra EE.UU., con 51. En tercer lugar y a distancia, se sitúa Alemania, con 17 referencias. En España, en el periodo analizado, se publicó tan sólo una. En la Tabla 4 se recogen los ámbitos de protección más representativos de las invenciones correspondientes a las distintas tecnologías.

	País	Nº Documentos
1	PCT	90
2	EE.UU. (US)	51
3	Alemania (DE)	17
4	Francia (FR)	14
5	EP	13
7	Brasil (BR)	11
7	Turquía (TR)	11
8	Reino Unido (GB)	7

**Tabla 3.** Ranking por países (excluyendo países asiáticos)

	Tipos de Tecnología (Nº Documentos)		
	Termoquímicas	Bioquímicas	Químicas
PCT	67	25	4
EP	12	1	0
Alemania (DE)	14	3	1
Brasil (BR)	4	3	5
EE.UU. (US)	41	9	4
Francia (FR)	10	6	1
Reino Unido (GB)	7	0	0
Turquía (TR)	11	0	0
<b>Nº Familias totales</b>	<b>150</b>	<b>44</b>	<b>14</b>

**Tabla 4.** 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
GB2545103	Bio-Bean Ltd (GB)	<b>Biofuel.</b> Biofuel composition comprising waste coffee grounds (WCG). It is preferably solid, formed as briquettes, pucks or pellets, the pellets being suitable for combustion in a biomass boiler. Preferably it comprises at least 50% wt WCG, even more preferably at least 75%. At least half of this quantity is preferably made up of waste coffee grounds from the manufacture of instant coffee (IWCG). The biofuel may additionally contain a fibrous filler (sawdust, coffee bean husks), preferably less than 50% wt, and a binding agent (lignosulphonate, glycerol), preferably up to 10% wt. Other possible ingredients are oxidisers like sodium / potassium nitrate and processing agents like starch (also a binder). The biofuel preferably has a durability of at least 60% and a net calorific value of 16-24 MJ/kg. A method of producing such biofuel is also claimed, by compressing suitable feedstock into pellets etc. The WCG may be dried to a moisture content of 6-20%. Coffee oil is preferably extracted therefrom, then the WCG are mixed with other ingredients and the feedstock may be conditioned through treatment with steam, then pressed / extruded through a die having boreholes into pellets which are further cooled. A relevant apparatus is also claimed.
WO2017076375	Blaze Harmony S R O (CZ)	<b>Boiler with automatic detection of optimum thickness of the fuel layer.</b> The burning boiler with automatic detection of the optimum thickness of the basic fuel layer containing the movable bottom (6), while this movable bottom (6) of the loading area (3) is interconnected with the position sensor (19) or force sensor (26) for detecting the optimum thickness of the basic fuel layer. According to the advantageous embodiment of the invention, the position sensor (19) or the force sensor (26) is interconnected with the controller (4) which controls the combustion product: fan (1). The surfaces (6.1) of the movable bottom (6) of the loading area (3) are integral and tilted down towards the combustion product exhaust nozzle (10). The top edge of the movable bottom (6) determines the primary air supply (12) in the loading area (3). The bottom edge of the movable bottom (6) determines the secondary air supply (9) in the nozzle (10).
FR3043756	Cazenave Oliver (FR)	<b>Device for igniting wooden log in e.g. wood burning stove.</b> The device has a compartment (1) for containing pellets, where the pellets are intended to provide a flame ready to cause the inflammation of a wooden log arranged at the top of the compartment when the pellets are ignited. A base (2) supporting the compartment includes a solid fire lighter to provide heat to cause the ignition of the pellets. A grid (3) arranged between the base and the compartment includes openings to allow the circulation of an air flow between the base and the compartment and to retain the pellets contained in the compartment.
DE202016008223	Denk Keramische Werkstätten E K (DE)	<b>Ignition device for igniting e.g. wooden board in chimney, has open fire channel which is provided for holding igniting agent with volume of specific range, while extending upper edge portion of side walls in variable altitude.</b> The device (01) has a device main portion which is provided with side walls (03a,03b) that are formed with a shape which is uniformly curved relative to its longitudinal axis. The transverse walls (04) are made as shorter than shorter ones of side walls. A contact surface (08) for placement of ignition device in fire location is formed in underside of base. The upper edge portion (09) of the side walls are extended in a variable altitude as opposite to contact surface. The channel (05) is provided for holding an igniting agent with volume of 50 to 300 ml.
DE202017000231	Hug Peter (DE)	<b>Device for burning pattern into grilling product on grill grate of wood charcoal or gas grill, has device plate which is provided with continuous contour in form of character, number, logo or coat of arms or any other pattern.</b> The device (1) has a device plate (4) which is provided with a continuous contour in the form of character, number, logo or coat of arms or any other pattern. The device plate is made of metal sheet in which the contour pattern is cut out from the outside. The device plate is laterally provided with fixed lug (5) and releasable fastening portion for fixing device plate against displacement or lifting against a grill grate (3).

Nº Publicación	Solicitante (País)	Contenido técnico
EP3163162	Lasco Heutechnik GmbH (AT)	<b>Portable radiant heater.</b> The heater (2b) has a firing unit (4b) for burning solid fuel from a solid fuel storage unit (8b). A transparent radiation unit (6b) is utilized for radiating combustion heat into an environment. A flue gas duct upwardly guides flue gas through the transparent radiation unit. A conveying unit (10b) conveys the solid fuel to the firing unit. The solid fuel storage unit is arranged on a bottom part of the firing unit. The conveying unit delivers the solid fuel from the solid fuel storage unit to a burner plate (96) of the firing unit such that the solid fuel is discharged onto the burner plate.
WO2017078762	Lorenz Nathan (US)	<b>Biomass stove has outer housing, cook-top, upper internal section, and lower internal section.</b> The biomass stove (800) has outer housing (116), a cook-top (812), an upper internal section, and a lower internal section. The upper internal section is provided with upper and lower combustion chambers, and a grate. The lower combustion chamber is conically shaped with a larger diameter adjacent to the upper combustion chamber. The lower combustion chamber is provided with a height and an angle optimized with the larger diameter to minimize the loss of radiant heat that originates in the lower combustion chamber and is directed out of an inlet of an air intake chamber.
US2017146239	Maxitrol (US)	<b>Control system and method for a solid fuel combustion appliance.</b> Techniques for controlling a solid fuel combustion appliance, e.g., a wood burning stove, are disclosed. A control system measures an exhaust gas temperature of airflow through an outlet of the solid fuel combustion appliance. The control system determines a derivative of the exhaust gas temperature with respect to time. The derivative of the exhaust gas temperature with respect to time is compared to a predetermined threshold. The control system modulates the inlet damper in response to determining that the derivative of the exhaust gas temperature with respect to time reaches the predetermined threshold.
WO2017068163	McBride D (US)	<b>Thermal treatment device.</b> The present invention relates to a thermal treatment device comprising a primary chamber (204) for receiving waste material (230) to be combusted, the primary chamber having a hearth (207), a transport system (206) arranged for transportation of waste material across the hearth, a mixing chamber (220) in fluid communication with the primary chamber (204); a secondary chamber (208) in fluid communication with the mixing chamber (220), and material introducing means (229) for introducing waste material (230) into the primary chamber, wherein the material introducing means (229) comprises a valve (202) for controlling air flow there-through.
DE202017001363	Riener KS (AT)	<b>Biomass oven i.e. pellet oven, for combustion of solid biomass e.g. wood.</b> The oven (10) has a main chimney attachment provided with an air supply connection part (28) and a combustion gas diverter (26) that are arranged on a side surface of a combustion gas collection area (16). The air supply connection part is concentrically surrounds the combustion gas diverter. The air supply connection part and the combustion gas diverter are designed to directly connect a double-walled chimney with integrated supply air. The combustion gas collection area is equipped with a revision lid (24).
FR3041973	Rosado Jean-Francois (FR)	<b>Method for manufacturing fuel pellets.</b> Production of combustible granules involves compressing (E1) wood granules in a defibrated state. The granules are used as the material used in the composition comprising a mixture of wood present between a stock (S1) of adjuvanted wood comprising wood, varnish and/or glue containing non-natural volatile organic compounds and/or heavy metals, and a non-adjuvanted timber stock (S2) devoid of synthetic organic compounds and heavy metals.
GB2545071	Suirvale Dev Ltd (IE)	<b>Fuel delivery for external wood pellet boiler.</b> The invention relates to an external wood pellet boiler 100 comprising a housing 110, boiler 130, a hopper for wood pellets 120, an auger 140 for delivering wood pellets from the hopper to the boiler and a fuel delivery means 125 for delivering wood pellets into the hopper, the fuel delivery means comprising a vacuum generator means for transporting wood pellets from a separate bulk fuel store to the external wood pellet boiler. The vacuum generator transport means comprises a cyclone means, wherein the boiler includes a lid 129 which incorporates the cyclone means and wherein the cyclone means is attached to the underside of the lid. The lid preferably being hinged to allow manual supply of the solid fuel. The vacuum generator preferably being operated by a control system to auto fill the hopper when necessary.
BR102015022071	VLC Indústria E Comércio Ltda (BR)	<b>Wastewater recovery system in sugar and ethanol plants.</b> Wastewater recovery system in sugar and ethanol plants, by utilizing a water recovery process that utilizes biomass boiler water recovery plant as a means to recover wastewater of industrial process of sugar and ethanol plants, so that these waters can be reused again in the stages of same industrial process, comprises: removing means of suspended/ soluble solids and pH control; biomass boiler water recovery system; soot plant; recovery of other waters; recovery of vinasse water; recovery of cane washing water; and production of a pie rich in fertilizers e.g. potassium and organic materials.

## PIRÓLISIS/GASIFICACIÓN

Nº Publicación	Solicitante (País)	Contenido técnico
WO2017083544	Board of Regents of the Nevada System of Higher Education on behalf of the Univ of Nevada Reno (US)	<b>System for hydrothermal treatment of wet biomass.</b> System comprises a feed chamber (102) for receiving a wet biomass mixture, a high pressure pump operationally coupled to the feed chamber, a heating system for heating pressurized cold wet biomass mixture to a reaction temperature, a reaction chamber coupled to the feed chamber and high pressure slurry pump, a cooling chamber with a first end and a second end, a receiving tank (114) coupled to the second end of the cooling chamber, and a pressure reduction system that allows the produced liquid and solid products to exit the horizontal cooling chamber (110).
US2017145332	Clean Electricity Generation UK Ltd (GB)	<b>Torrefaction/gassification system.</b> A modified dryer operates on a different principle from that used by the prior torrefaction plants. The subject invention utilizes thermal conduction to torrefy the biomass in a vibratory reactor in which a heated solid unperforated plate is sealed in the reactor to separate the biomass above from the gas used to heat the plate below. This permits using inert flue gas to heat the reactor which in turn permits the use of a cool air damping system to prevent thermal runaway. Also syngas evolved from the process is utilized to power a gas engine, the exhaust output of which is recirculated to heat the reactor plate. When the gas engine is coupled to an electric generator, waste energy is recovered for use in other parts of the plant or exported elsewhere.
EP3173459	Commissariat à L'énergie Atomique et aux Énergies Alternatives (FR)	<b>Quick-pyrolysis reactor of organic particles of biomass with counter-current injection of hot gases.</b> Rapid pyrolysis reactor (1) for organic biomass particles (2), comprises: a reaction vessel (3) comprising an upper part and a lower part opposite to the upper part, in which the pyrolysis reaction of the particles occurs; an injection device (4) for injecting particles into the upper part of the reaction vessel in order to form a gravity flow of particles; a discharge conduit (5) for the products resulting from the pyrolysis reaction present in the reaction chamber; and a hot gas countercurrent injection duct in the lower part of the reaction vessel.
WO2017078225	Daekyung Esco Co Ltd (KR)	<b>Bio oil recovering apparatus using plasma wind.</b> The present invention relates to a bio oil recovering apparatus using plasma wind, the apparatus introducing organic waste into a reactor and recovering bio oil by means of pyrolysis using plasma wind. To this end, the bio oil recovering apparatus using plasma wind of the present invention is configured to include: a pyrolysis unit that uses plasma wind and pyrolyzes received organic waste; an oil recovery unit that separates, cools, and recovers bio oil contained in exhaust gas discharged from the pyrolysis unit; a gas circulation unit that supplies the exhaust gas discharged from the oil recovery unit to the pyrolysis unit and circulates the gas; and a thermal wind supply unit that supplies thermal wind for maintaining heat inside the pyrolysis unit or the gas circulation unit.
US2017114279	Enventix Inc (US)	<b>Pyrolysis reactor.</b> The disclosure provides several pyrolysis reactor configurations and associated methods for generating pyrolysis products (e.g., oil, gas, and/or char) from organic feedstock.
US2017158967	Exxonmobil Res and Eng Co (US)	<b>Crude bio oil pretreatment and upgrading.</b> Systems and methods are provided for pretreatment and upgrading of crude bio oils for further processing and/or use as fuel products. Crude bio oils can be treated by one or more of flash fractionation and thermal cracking to generate fractions suitable for further processing, such as further hydroprocessing. Blending of crude bio oil fractions with mineral feeds can also be used to reduce metals contents to levels suitable for refinery processing.
FR3043408	IFP Energies Now (FR)	<b>Processing lignocellulosic biomass, by preparing powder, performing fluidization step by injecting fluidization gas, injecting fluidized medium into gasification step to produce gas.</b> Method for processing lignocellulosic biomass involves (a) preparing powder having particle size of 15-900 $\mu$ m, preferably 20-500 $\mu$ m, $\geq$ 20 wt.% water content, 500-900 kgm <sup>-3</sup> grain density and fluidization speed of 0-0.15, preferably $\geq$ 0.1, (b) performing fluidization of at least one portion of powder, alone or as mixture by injecting fluidizing gas, and (c) injecting fluidized medium into a gasification step to produce gas containing carbon monoxide and hydrogen, and preparing powder by biochemical treatment to obtain wood residue and processing wood residue to obtain powder.

Nº Publicación	Solicitante (País)	Contenido técnico
WO2017053815	Inaeris Tech LLC (US)	<b>Catalyst addition to a circulating fluidized bed reactor.</b> Biomass is converted into a bio-oil containing stream in a riser reactor having multiple ports for the entry of fresh catalyst. Hard coke formed during pyrolysis may be separated from the riser effluent fraction containing which contains spent catalyst, soft coke and char. The separated hard coke may then be fed back into the riser reactor. The riser reactor may further have a cooling media which quenches the rapid heat transfer to the biomass during pyrolysis of the biomass in the mixing zone of the riser.
WO2017091771	Inaeris Tech LLC (US)	<b>Process of upgrading light hydrocarbons and oxygenates produced during catalytic pyrolysis of biomass.</b> The C2-C4 olefins and dienes and/or C1-C4 oxygenates in produced gas resulting from the catalytic pyrolysis of biomass may be upgraded to C5+ hydrocarbons and/or C5+ oxygenates in the gaseous phase or in the liquid phase. In addition, the C2-C4 olefins and dienes and/or C1-C4 oxygenates in produced water maybe upgraded to C5+ hydrocarbons and/or C5+ oxygenates in the gaseous phase.
US9611197	Kior Inc (US)	<b>Method of removing undesirable solid components from a renewable or non-renewable feed and apparatus used in same.</b> A filter media for the removal of undesirable solid components from a fuel feedstock contains biomass and a catalyst used from the thermocatalytic conversion of biomass into bio-oil.
WO2017095316	Ren Fuel K2B AB (US)	<b>Depolymerized lignin in hydrocarbon oil.</b> The present invention relates to a composition comprising depolymerized lignin derivatives and a solvent and wherein the composition is suitable for preparing fuel. The depolymerized lignin comprises phenol derivatives and the composition has a very low metal content.
PL413892	Sea Wagner Sp Zoo (PL)	<b>Heat energy recovering-type method for preparing phosphorus-potassium raw materials of biomass in thermal energy plant.</b> The method involves mixing particulate biomass of plants with meat and bone meal. Resulting mixture is subjected to form non-combustible residues. Flame combusted gas carbonization is subjected to melt to form a liquid reservoir. Burning combustible gases are mixed. Non-combustible residues are separated in a cooled water separator (10). Non-flammable gases are cooled. A heat recovery and purification of particulate matter is processed in a filter. The non-combustible residues are discharged to a cooler.
US2017137284	Sundrop Fuels Inc (US)	<b>Various methods and apparatuses for multi-stage synthesis gas generation.</b> A multiple stage synthesis gas generation system is disclosed including a high radiant heat flux reactor, a gasifier reactor control system, and a Steam Methane Reformer (SMR) reactor. The SMR reactor is in parallel and cooperates with the high radiant heat flux reactor to produce a high quality syngas mixture for MeOH synthesis. The resultant products from the two reactors may be used for the MeOH synthesis. The SMR provides hydrogen rich syngas to be mixed with the potentially carbon monoxide rich syngas from the high radiant heat flux reactor. The combination of syngas component streams from the two reactors can provide the required hydrogen to carbon monoxide ratio for methanol synthesis. The SMR reactor control system and a gasifier reactor control system interact to produce a high quality syngas mixture for the MeOH synthesis.
US9663719	Tharpe Jr Johnny M (US)	<b>Systems, apparatus and methods for optimizing the rapid pyrolysis of biomass.</b> Efficient biomass conversion systems, methods and apparatus utilize a fast pyrolysis unit installed at locations having substantial quantities of biomass, with the biomass fed into the fast pyrolysis unit under pyrolytic reaction conditions, and with exhaust gases containing entrained matter resulting from the pyrolytic reactions being separated into char and bio-fuel constituents.

# TECNOLOGÍAS BIOQUÍMICAS

## PATENTES

DIGESTIÓN ANAERÓBICA		
Nº Publicación	Solicitante (País)	Contenido técnico
FR3043690	Air Liquide (FR)	<b>Generating station for producing biomethane from lignocellulosic biomass, has cryo-crusher that grinds lignocellulosic biomass from compressor-condenser-expansion valve assembly using carbon dioxide snow.</b> The generating station has a methanizer (3) that is provided for producing biogas (4). A biogas purification system (5) allows the production of biomethane (2) and carbon dioxide (10). The compressor-condenser-expansion valve assemblies (6-8) enable the production of carbon dioxide snow (11) from the carbon dioxide coming from the biogas cleaning system. A cryo-crusher (9) grinds the lignocellulosic biomass (1) from the compressor-condenser-expansion valve assembly using carbon dioxide snow prior to introduction into the methanizer.
BR102015009801	Clean Tech Soluções (BR)	<b>Thermomechanical anaerobic biodigester used to generate biogas, comprises e.g. hermetically sealed cylindrical tank, bullet upper dome with valve for extracting biogas, and duct for introduction of biomass and safety relief valve.</b> Thermomechanical anaerobic biodigester comprises: e.g. a hermetically sealed cylindrical tank; bullet upper dome (2) with valve for extracting the biogas (3) produced in its interior, duct for introduction of biomass (4) and safety relief valve (5); flat base away from the ground; inlet box (6) affixed to external base of the biodigester; pumping ducts of the liquids collected in the base tray and vertical central axis; perforated U-shaped basket; inspection window; and control panel in the external area and vacuum withdrawal duct of the biodigester.
WO2017076514	D Tech Holding B V (FR)	<b>Method and device for processing solid waste.</b> Process involves pressing organic waste to produce pressed organic waste, removing floatables from the pressed organic waste to produce decontaminated organic waste, and treating the decontaminated organic waste in a wet anaerobic digester.
WO2017046822	Marcopolo Eng SPA Sistemi Ecologici (IT)	<b>Multi-year cyclic biodigester.</b> The present invention relates to a digester for the control of the anaerobic digestion of biomass. The biodigester for multi-year management of a waste biomass (108), comprises unit for recirculating the process liquid. The process liquid comprises the liquid leached from the waste.
EP3162898	Tirsi SRL (IT)	<b>Process for the production of biogas from a solid digestate.</b> The invention relates to a process that allows the production of biogas by fermentation of a solid digestate obtained as a waste product of biogas production plants using products with a high content of cellulosic fibers as raw material, with savings of ingestate. The invention further relates to selected bacteria species of Clostridium thermocellum, and their use in the process of biogas production from cellulosic fiber-rich materials.
WO2017080565	Xergi Nix Tech AS (DK)	<b>Method for poultry litter fermentation and biogas production.</b> The present invention facilitates an efficient fractionation and processing of a poultry manure comprising biomass. The present invention also enables an increased production of renewable energy, such as biogas, from a continuous, anaerobic liquid state fermentation of a poultry manure comprising biomass. A fractionation of a fermented poultry manure comprising biomass into solid and liquid fermentation medium fractions, and subsequent processing and re-cycling of the liquid fermentation medium fraction, ensures an optimal utilization of the energy potential associated with each of said solid and liquid fermentation medium fractions.
WO2017085290	Yannco (FR)	<b>Device for methanization from solid biomass and process for producing corresponding biogas.</b> The present invention relates to a methanization digester (7), intended for the production of biogas (32), comprising a tank (8), capable of containing a container (22) containing solid biomass (23), said methanization digester (7) comprising, in the upper part thereof: at least one zone (9) for introducing a container (22) containing solid biomass (23) and for discharging the container containing residual digested solid biomass (23'), on which a roof (24) is capable of being opened and of being reclosed, and at least one zone (9') for discharging the biogas (32). The invention also relates to a process for producing biogas and also to a methanization facility using a main digestion unit (1) intended in particular to feed, with liquid digestate (5), one or more methanization digesters (7) containing solid biomass (23), and to receive and store the biogas (32) produced by the methanization digester(s) (7).
DE102015015776	Zweckverband Abfallbehandlung Kahlenberg (DE)	<b>Method for the utilization of moist material and dry material, as well as to an apparatus for carrying out this process.</b> Processing biomass, comprises: (a) storing biomass, preferably feral material, in the form of silage, (b) withdrawing the silage, (c) providing a biomass to a stirrer reactor with addition of water, (d) pressing biomass in a press, preferably a worm press, (e) feeding the liquid material stream to an anaerobic treatment, (f) drying solid stream is thermally and/or biologically, (g) thermally treating of the treated solid stream, (h) recovering biogas, (i) utilizing water as a liquid fertilizer, (j) using the resulting boiler ash as supplementary fertilizer in cultivated grassland.



## FERMENTACIÓN DE AZÚCARES

Nº Publicación	Solicitante (País)	Contenido técnico
US2017152537	Cavitation Tech Inc (US)	<b>Processes for increasing bioalcohol yield from biomass.</b> A process for increasing alcohol yield from biomass (the form or agro- or forest residue, grains, hops, etc.), involving multiple hydrodynamic cavitation treatments of biomass filtrate—both before and after fermentation. Carbohydrates extracted from biomass are subjected to a first cavitation treatment to promote additional conversion into carbohydrates. The carbohydrates are then combined with bacterial species and nutrients, and allowed to ferment. The fermentation product is subjected to a second hydrodynamic cavitation treatment to promote further conversion of carbohydrates into bioalcohol. After distillation, the bioalcohol is subjected to a second hydrodynamic cavitation treatment to increase its purity.
MY158109	Dato Otsuka Motohiro (JP)	<b>Method of obtaining ethanol from oil palm wood.</b> Manufacture of ethanol involves preparing wood material as feed to be processed, extracting sugar(s) from the wood material using a hot water-based solvent, saccharifying the sugar extract to obtain a monosaccharide saccharified solution, and fermenting the monosaccharide in the saccharified solution. The wood material is chosen from palm (Arecaceae) family comprising trees over 20 years old and having height of 3.5 m or more above ground.
WO2017060195	DSM IP Assets BV (NL)	<b>Eukaryotic cell with increased production of fermentation product.</b> New genetically modified eukaryotic cell useful for fermenting substrate to fermentation product e.g. ethanol, comprises heterologous gene encoding D-glucose-6-phosphate dehydrogenase, or 6-phosphogluconate dehydrogenase.
WO2017050242	Novozymes AS (DK)	<b>New polypeptide having cellobiohydrolase activity, useful for degrading and fermenting a cellulosic or hemicellulosic material and producing a fermentation product.</b> Disclosed herein are polypeptides having cellobiohydrolase activity, catalytic domains, carbohydrate binding modules and polynucleotides encoding the polypeptides, catalytic domains or carbohydrate binding modules. Disclosed herein are nucleic acid constructs, vectors and host cells comprise the polynucleotides as well as their uses, and methods of producing the polypeptides, catalytic domains, carbohydrate binding modules.
WO2017076380	Ptacek Milan (CZ)	<b>Method of processing cereal and/or maize grains in production of bioalcohol, fuel and apparatus for carrying out the method.</b> The solution describes a method of processing of cereal and/or maize grains in the production of bioalcohol, wherein the cereal and/or maize grain is first cleaned from pericarp, and seed coat, and/or germs, the endosperm obtained from the separation of the pericarp, and the seed coat, and/or germs from the cereal and/or maize grain is saccharified, fermented, and then distilled to obtain bioalcohol and bioavailable material, which is at least partially dewatered, while the separated pericarp and the seed coat and/or germs are combusted in a boiler in a distillery. The bioavailable material is an at least partially dewatered mass, which has remained in the distillation column after distillation of endosperm charge. There is also a fuel to be combusted in a boiler of a distillery for bioalcohol, the fuel comprising separated pericarp, and seed coat, and/or germs from the cereal and/or maize grain, and may comprise milled further products. There is also an apparatus for carrying out the method, the apparatus comprising at least one distillation column (1), wherein the at least one distillation column (1) is connected via its outlet for alcohol vapours with an inlet of a condenser/cooler (2), which is equipped with an outlet of bioalcohol, while a steam inlet into the distillation column (1) is connected with a steam outlet from a boiler (7) and an inlet of mash of the distillation column (1) is connected with an outlet of mash of a fermentation tank (20). The distillation column (1) is via a stillage outlet connected with a dewatering unit (3) and/or a biogas plant (10), the fermentation tank (20) is via its inlet connected with the outlet of endosperm of a separator (12) of pericarp and seed coat, eventually germs, while an outlet from the separator (12) for pericarp and seed coat, eventually germs is connected with an inlet of pericarp and seed coat, eventually germs of a mixing unit (6) for pericarp and seed coat, eventually germs, while an inlet of the mixing unit (6) for milled substances is connected with an outlet of a storage tank (21) of milled substances, and an outlet from the mixing unit (6) for pericarp and seed coat, eventually germs, is connected to a fuel inlet of the boiler (7), while the distillation column (1) is connected via a stillage outlet with a dewatering unit (3) and/or with the biogas plant (10), while the fermentation tank (20) is connected via its inlet with an endosperm outlet of the separator (12) of pericarp and seed coat, eventually germs, wherein an outlet for pericarp and seed coat, eventually germs, from the separator (12) is connected with the fuel inlet of the boiler (7).
WO2017076421	Renesciences (DK)	<b>Solubilization of MSW with blend enzymes.</b> Solubilizing waste, used to produce fermentation product e.g. fuel, involves contacting waste with enzyme composition comprising cellulolytic background composition and at least one enzyme consisting of protease or lipase and beta-glucanase.

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WO2017091781	Sandia Corp (US)	<b>Ammonium based ionic liquids useful for lignocellulosic processing.</b> Method (M1) of treating a biomass comprising polysaccharide and lignin, comprises: (a) providing a pre-treatment mixture comprising at least 5 wt.% of the biomass, at least 40 wt.% of an ionic liquid or mixture of ionic liquids, and optionally water; (b) maintaining the mixture under pre-treatment conditions sufficient to dissolve at least a portion of the polysaccharide present in the biomass, where the pre-treatment conditions comprise a temperature of at least 20° C and ≤ 100° C for a duration of at least 0.5 hours.
WO2017047830	SK Innovation Co Ltd (KR)	<b>Reactor for continuously saccharifying biomass.</b> The present invention relates to a reactor for saccharifying biomass containing a high concentration of solids, and more particularly, to a reactor for continuously saccharifying biomass comprising: a porous plate in which a nozzle for supplying an additive, containing a saccharifying enzyme, and a sensor are provided on an inner cross-section of a hole; and a stirring means.
WO2017090055	Surana Rajendra (IN)	<b>A method of producing high amount of ethanol at high temperature by modified yeast strain <i>Saccharomyces cerevisiae</i>.</b> The present invention relates to a modified yeast strain of <i>Saccharomyces cerevisiae</i> having MCC accession number 0069 with osmo-tolerant, thermo-tolerant, ethanol tolerant and self-flocculation properties. Further, the present invention relates to a method for obtaining modified yeast strain. The present invention also relates to a method of production of ethanol at high temperature using said yeast strain. The ethanol produced by the method disclosed in the present invention is used as fuel.
BR102015024183	Univ Fed Alagoas (BR)	<b>Producing bio-ethanol from <i>nopalea cochenilifera</i> involves obtaining <i>nopalea cochenilifera</i> then washing and sanitizing using sodium hypochlorite and drying to obtain clean <i>nopalea cochenilifera</i>.</b> Producing bio-ethanol involves obtaining <i>nopalea cochenilifera</i> then washing and sanitizing using sodium hypochlorite and drying at 50-60° C to obtain clean <i>nopalea cochenilifera</i> . The obtained clean <i>nopalea cochenilifera</i> is subjected to milling using knives to obtain <i>nopalea cochenilifera</i> powder. The obtained <i>nopalea cochenilifera</i> powder is added and mixed with sulfuric acid, sodium hydroxide or with only distilled water at 115-135° C to obtain <i>nopalea cochenilifera</i> extract.

# TECNOLOGÍAS QUÍMICAS

## PATENTES

Nº Publicación	Solicitante (País)	Contenido técnico
US9676678	Agee Kenneth L (US)	<b>Renewable fuels co-processing.</b> A gas to liquids process with a reduced CO <sub>2</sub> footprint to convert natural gas and a renewable feed stock material into fuels or chemicals. In one non-limiting embodiment of the invention, a natural gas feed is converted into synthesis gas containing hydrogen and carbon monoxide. A minor portion of the hydrogen is thereafter extracted from the synthesis gas. The synthesis gas is converted to hydrocarbons in a Fischer Tropsch reaction. The Fischer Tropsch hydrocarbon product and a renewable feedstock are hydro processed with the extracted hydrogen in order to produce fuels and/or chemicals. Waste products from the renewable feed are recycled to produce additional synthesis gas for the Fischer Tropsch reaction.
BR102015019876	Inst de Tecnologia e Pesquisa (BR)	<b>Producing oil, biodiesel and bio-oil from oilseed biomass by using pressurized fluids, involves extracting oil from source of raw material by using pressurized solvent or mixture of solvents to obtain vegetable oil of oilseeds.</b> Oil, biodiesel and bio-oil production involves extracting oil from source of raw material by using a pressurized solvent or mixture of solvents to obtain vegetable oil of oilseeds. The solvent or mixture of solvents is pumped by high pressure pumps (1) to extractors or reactors (6) which contain a biomass bed, and are inserted into temperature control furnaces. The solvent is displaced through a bed of vegetable matter for solvating vegetable oil. The mixture is displaced directly into a tubular reactor (8) which is inserted into a furnace for controlling temperature of the system (7).
BRPI0703303	Inst Nac de Tecnologia Int (BR)	<b>Process to obtain biofuels for diesel motors.</b> Obtaining biofuel involves mixing alcohols with any alkaline catalyst, diesel oil, kerosene and triglycerides with stirring. The mixture is warmed to 20-50° C for 45 minutes and then allowed to stand to obtain separate layers. The alcohol phase and the supernatant are shaken for 15 minutes for solubilising the waste of glycerine and catalyst in alcohol. The supernatant is the distilled to obtain a mixture of biofuel.
WO2017065573	Korea Energy Research Inst (KR)	<b>Method for producing synthetic fuel having high diesel and gasoline contents using slurry bubble column reactor.</b> The present invention relates to a method for producing synthetic fuel having high diesel and gasoline contents using a slurry bubble column reactor. The present invention can provide an optimal process which enables the production of a Fischer-Tropsch synthesis reaction product having increased diesel and gasoline contents, rather than the production of wax, by operating, at a high temperature, a conventional slurry bubble column reactor (SBCR) which has been mainly applied to a low-temperature FT reaction.
WO2017060471	Novozymes AS (DK)	<b>Enzymatic or non-enzymatic biodiesel polishing process.</b> The present invention provides a method for reducing the level of free fatty acids in biodiesel/fatty acid alkyl esters. The method comprises providing a composition comprising fatty acid alkyl esters, free fatty acids and/or a fatty acid feedstock, reacting said free fatty acids and/or said fatty acid feedstock with alcohol in the presence of one or more liquid lipolytic enzymes to produce fatty acid alkyl esters; and/or reacting the free fatty acids and/or said fatty acid feedstock with alcohol in the presence of one or more non-enzymatic catalysts to produce fatty acid alkyl esters.
US2017114291	Res USA LLC (US)	<b>Biomass high efficiency hydrothermal reformer.</b> Producing synthesis gas comprises mixing a carbonaceous feed comprising at least one carbonaceous material with superheated steam to produce a reformer feedstock, and reforming the reformer feedstock to produce a first synthesis gas comprising hydrogen, and carbon monoxide by introducing the reformer feedstock into a many coiled tubes within a reformer at a reformer temperature and a reformer pressure at which at least a portion of the reformer feedstock is converted to synthesis gas. The method is useful for producing synthesis gas (claimed) which is useful for production of Fischer-Tropsch hydrocarbons, alcohols and/or other oxidized compounds, or other synthesis gas conversion products.
BR102015018088	Univ Estadual Paulista Julio de Mesquita Filho (BR)	<b>Obtaining high activity lipase for catalyzing transformation of vegetable oils into biodiesel.</b> Obtaining high activity lipase involves collecting byproducts obtained from orange processing, performing mechanical grinding; freezing for 24 hours; lyophilizing for 48 hours; freezing, fractionating, centrifuging; performing dialysis of the precipitate, freezing for 24 hours; and lyophilizing for 48 hours.

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# VT BIOMASA

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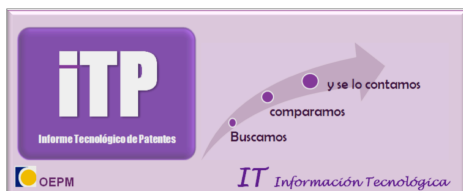
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