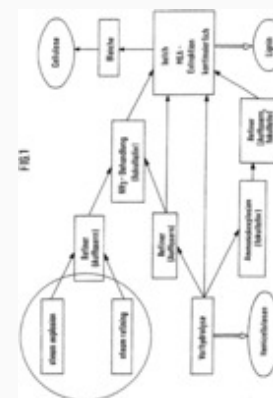


983 results for (biomass and mill+ and treat+ and flash and (therm+ or heat+) and screw and lign+)/TI/AB/TX - Collection: FAMPAT

#	Title	Publication number	Publ. date	Applicant/Assignee		
1.	Method for separating lignocellulose-containing biomass	EP1190137	2002-03-27	ZYLUM BETEILIGUNGSGESELLSCHAFT MBH RHODIA ACETOW	100 %	

The invention relates to a method for separating lignocellulose-containing biomass, especially wood, into the essential components in the form of lignin, hemicellulose and cellulose, with the following steps: a) pre-hydrolyzing the lignocellulose-containing biomass by treating it with water or steam; b) extracting the hydrolyzed hemicellulose obtained by pre-hydrolyzation with an aqueous medium; c) extracting the process-modified lignin that remains in the residue with an alkanolamine, isolating the lignin, recovering the alkanolamine, whereby the alkanolamine is not substituted by alkyl groups at the nitrogen atom, and d) obtaining a cellulose raw material. The inventive method is characterized in that hemicelluloses and lignin can be specifically separated from the cellulose in two different process steps. For this purpose, simple and commercially available system components can be used that facilitate an economical operation also with small installations.

The invention relates to a device for producing an energy carrier and/or raw material carrier from moisture-containing and/or dry **biomass** with the aid of a **heatable** carbonisation reactor (1) having a closable inlet opening (13). The **biomass** is converted in the carbonisation reactor (1) into a solid, pourable or gaseous energy carrier and/or raw material carrier and for interim storage of the energy carrier and/or raw material carrier is then delivered via a closable outlet opening (14) to a coolable tank (9) connected to the carbonisation reactor (1). The tank (9) is connected to an adjoining **heatable** gasification reactor (16), in which gas and waste substances, such as ash, are separated from the energy carrier. The device is characterised by the following features: a) the carbonisation reactor (1) is surrounded by a **heating** jacket to which external **thermal** energy is fed and to which further **thermal** energy at least from the gasification reactor (16) is fed; b) cooling energy is fed to the gasification reactor from a second tank or cooling tank (9); c) water is fed to the second tank or cooling tank (9) in order to ensure an approximately constant humidity, at least for the charcoal production; d) reaction gas is fed from the carbonisation reactor (1) and/or the second tank or cooling tank (9) to a gas storage facility (20).



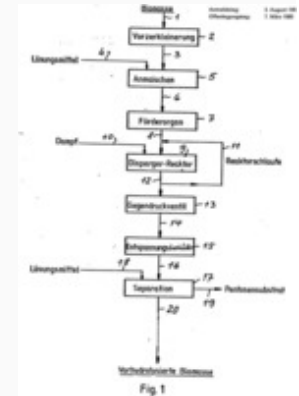
3. **Method for hydrolyzing lignocellulosic biomass without acid** FR2550550 1985-02-15 99 %

KRUPP INDUSTRIE-TECHNIK

FRIED KRUPP 4300 ESSEN

A process for the hydrolysis at high pressures and temperatures of organic matter with a ligno-cellulose content, particularly ground wood, bagasse and corn on the cob waste comprises three steps, whereby the fractions of the organic matter, namely pentoses, lignin and hexoses are separated from one another in succession in separate steps in the process. Both prehydrolysis for separating out the pentoses and the main hydrolysis process for separating out the hexoses are performed at elevated temperatures and pressures with a high degree of mechanical treatment in a dispersing reactor. The resulting sugars are prevented from dissociating by means of rapid cooling by flash evaporation. The ligno-cellulose aggregate, freed of pentoses, is conveyed off for further splitting in order to remove the lignin after which the remaining organic matter, comprised overwhelmingly of cellulose, is submitted to the main hydrolysis process as a result of which highly concentrated glucose is extracted for the production of ethyl alcohol.

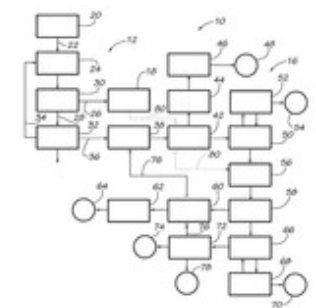
(From GB2145090 A)



4. **Method for producing levulinic acid from lignocellulosic biomass** EP2825519 2015-01-21 99 %

GEORGIA PACIFIC

A method for producing levulinic acid from lignocellulosic biomass comprising hemicellulose including one or more six carbon chain compound precursors comprises the steps of hydrolyzing the lignocellulosic biomass to form a first phase comprising partially hydrolyzed lignocellulosic biomass including cellulose and lignin and a second phase comprising one or more five carbon chain sugars and one or more six carbon chain sugars from degradation of the hemicellulose, separating the first phase from the second phase, and converting at least a portion of the one or more six carbon chain sugars to levulinic acid.

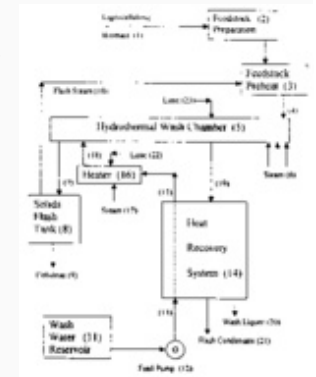


5. **Cellulose production from lignocellulosic biomass** EP1328679 2003-07-23 99 %

PUREVISION TECHNOLOGY

PUREVISION TECNOLOGY

A multi-function process for the separation of cellulose fibers (9) from the other constituents of lignocellulosic biomass such as found in grasses, agricultural waste, and waste paper with application in the preparation of feedstocks (1) for use in the manufacture of paper, plastics, ethanol, and other chemicals. This process minimizes waste disposal problems since it only uses only steam (6), water, and oxygen at elevated temperature in the range of 180 OC to 240 OC for 1 to 10 minutes plus a small amount of chemical reagents (23) to maintain pH in the range 8 to 13. An energy recuperation function is important to the economic viability of the process.



6. Pretreatment of lignocellulosic biomass through removal of inhibitory compounds EP2430076

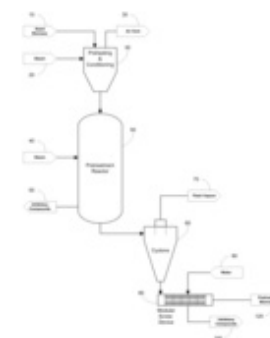
2012-03-21

GREENFIELD SPECIALTY ALCOHOLS

GREENFIELD ETHANOL

99 %

A process for the pretreatment of lignocellulosic biomass is disclosed. The process is intended for use in connection with biomass to ethanol processes and is directed in particular to an economical removal of inhibitory compounds generated in biomass pretreatment, which are inhibitory to downstream hydrolysis and fermentation steps. The process includes the steps of heating the lignocellulosic biomass with steam to a preselected temperature, at a preselected pressure and for a preselected time to hydrolyze and solubilize hemicelluloses in the biomass; explosively decomposing the biomass into fibers, and extracting from the resulting reaction mixture a liquefied portion of the lignocellulosic biomass before or after explosive decomposition. The liquefied portion is extracted to remove compounds from the lignocellulosic biomass which are inhibitory to enzymatic cellulose hydrolysis and sugar fermentation to ethanol. For improved efficiency and economy, the inhibitory compounds are not completely removed. Furthermore, xylose has been found to be a good indicator compound for the general level of inhibitory compounds in the reaction mixture and the extraction step is therefore controlled on the basis of the xylose content in the reaction mixture. In particular, the extracting step is discontinued once a dry matter (dm) content of xylose, as monomer or oligomer, in the reaction mixture of 4% to 8% (w/w dm) is achieved. This most economically balances the practical need for inhibitory compound removal with the economical need to control and preferably minimize the costs of the overall ethanol production process.



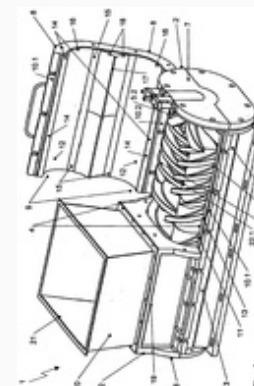
7. Twin screw extruder and method for the thermo-mechanical pulping of organic raw and residual materials EP2371525

2011-10-05

BOERNER JUERGEN

99 %

Twin-screw extruder (1) for thermomechanical digestion of organic raw materials and residues, comprises an elongated extruder housing (2) and two counter rotating screw extruders arranged parallel to each other. The elongated extruder housing exhibits a lower housing part (3) with U-shaped cross section on the inner side, with upward shell opening (4). The extruders are mounted only at a first end on the rear end plate of the elongated extruder housing and respectively exhibit a not mounted, free end module at the opposite second end. Twin-screw extruder (1) for thermomechanical digestion of organic raw materials and residues, comprises an elongated extruder housing (2) and two counter rotating screw extruders arranged parallel to each other. The elongated extruder housing exhibits a lower housing part (3) with U-shaped cross section on the inner side, with upward shell opening (4), which extends horizontally between a rear end plate (6) and a front face plate. The lower housing part forms a hollow cylindrical guide section in a closed state along with a cover, which on the inner side exhibits an inverted U-cup-shaped cross section with downward opening (9), by superimposing the opening of the housing part and the opening of the housing cover, where the guide section rests at the front of the end plate. The extruders (both of which are self-supported) are mounted only at a first end on the rear end plate of the elongated extruder housing and respectively exhibit a not mounted, free end module at the opposite second end, where the extruder screws are wrapped in the closed position at least partially by the hollow cylindrical guide section from the lower housing part and the housing cover. The lower housing part and the housing cover on their inner sides are respectively provided with wear inserts. The wear insert of the lower housing part exhibits a U-shaped cross section with upward curved side walls, which form the U-lower support in the U-shaped cross-section and are bent outward horizontally at their upper ends to the opening respectively under the formation of flanges. The wear liner of the housing cover exhibits inverted U-shaped cross section with two downwardly curved side walls, in a closed state. The downwardly curved side walls form the U-lower support in the U-shaped cross-section and are bent outward horizontally at their lower ends under the formation of flanges. In a closed state, when superimposing the openings, the two outwardly bent flanges of the lower housing part and the folded out ward flanges of the housing cover casing (8) are contacted with one another. The extruder screws respectively exhibit a screw pitch, which becomes smaller from the first end to beginning of the free end module, where the free end module has an opposite screw pitch. Independent claims are also included for: (1) a device for thermomechanical digestion of organic raw materials and residues, comprising a sub-frame, a drive module that is mounted on the sub-frame, with two engines and two transmitting cardan shaft for power transmission and two cardan shaft connected with the extruder axis, the twin screw extruder, which is arranged on the sub-frame behind the drive module, where the extruder screw of the twin screw extruder are driven by the drive module, and the sub-frame, on which the twin-screw extruder is attached, exhibits access doors for maintenance below the twin screw extruder; and (2) thermomechanical digestion of organic raw materials and residues, comprising supplying the material to be digested to the double screw extruder, in which the material is passed through an extrusion process.



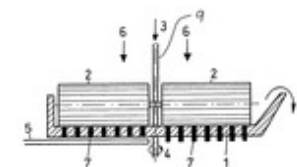
8. Method for pulping lignocellulose into fibre materials EP2143554

2010-01-13

AMANDUS KAHL

99 %

Disintegration of materials containing lignocellulose to fibers comprises mixing the materials with fiber-improving agents in a surface moisture condition with a flat die-pellet press to a fiber material with reduced internal porosity. Method for disintegration of materials containing lignocellulose to fibers comprises mixing the materials with fiber-improving agents in a surface moisture condition with a flat die-pellet press (1) to a fiber material with reduced internal porosity and rolled-fiber-improving agents.



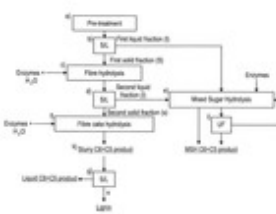
9.	Method for enzymatic saccharification of lignocellulosic biomass, and method for manufacturing ethanol from lignocellulosic biomass	EP2612920	2013-07-10	OJI HOLDINGS OJI PAPER	99 %
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Provided is a method for the enzymatic saccharification treatment of a lignocellulose-based raw material, in which a lignocellulose-based raw material which has been subjected to a pretreatment for making the raw material appropriate for an enzymatic saccharification reaction, is added together with an electrolyte containing a water-soluble salt, to cellulose saccharification enzyme-containing water; the lignocellulose-based raw material as a raw material suspension whose electrical conductivity has been adjusted to 5 mS/cm to 25 mS/cm, is subjected to an enzymatic saccharification treatment through an enzymatic saccharification reaction; the reaction product and an enzyme-containing solution are separated and recovered from the treated suspension after the enzymatic saccharification treatment; and the recovered enzyme-containing solution is recycled as an enzyme for the enzymatic saccharification treatment process.



10.	Method for preparing fermentable sugars from lignocellulosic biomass	WO2018/083301	2018-05-11	INBICON	99 %
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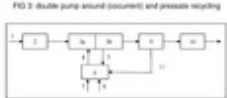
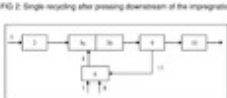
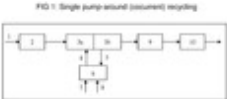
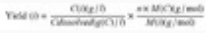
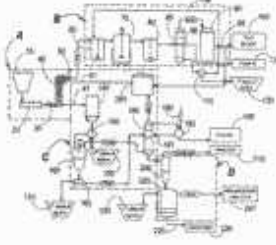
A method for providing a C5/C6 product from a lignocellulosic material is disclosed, said method comprising the steps: (i) pretreatment of the lignocellulosic material; (ii) solid/liquid separation of the pretreated lignocellulosic material from step (a) into a first solid fraction and a first liquid fraction; (iii) enzymatic fiber hydrolysis of said first solid fraction from step (b) by use of an enzyme composition capable of degrading lignocellulosic material, thereby providing a C5/C6 fiber slurry comprising C5 and/or C6 sugars; (iv) solid/liquid separation of the C5/C6 fiber slurry from step (c) into a second solid fraction and a second liquid fraction; and optionally (v) combining said first liquid fraction and said second liquid fraction for enzymatic mixed sugar hydrolysis (MSH), whereby a MSH C5/C6 product is provided.

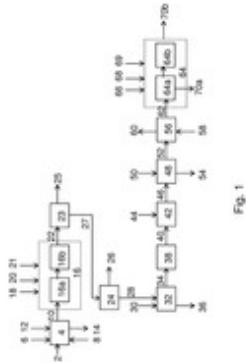
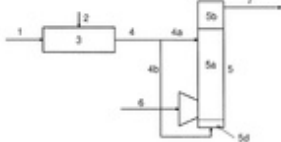


11.	Method for processing a lignocellulose or cellulose biomass by means of solid tungsten-based lewis acids	EP2534123	2012-12-19	CNRS - CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE IFP ENERGIES NOUVELLES UNIVERSITE CLAUDE BERNARD LYON 1	99 %
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The invention relates to a method for processing a lignocellulose or cellulose biomass using heterogeneous tungsten-based catalysts dispersed on a support based on (an) oxide(s), preferably (an) aluminium and/or zirconium and/or titanium and/or niobium oxide(s). The use of said catalysts results in the direct and highly selective production of lactic acid, while limiting the production of oligosaccharides and of soluble polymers.

tungstophosphorique $H_3PW_{12}O_{40}$

12.	Method for treating lignocellulosic biomass by impregnation and steam explosion	EP3484945	2019-05-22	AGRO INDUSTRIES RECHERCHE & DEVELOPPEMENT IFP ENERGIES NOUVELLES INRA - INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE ARD INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE 1 more...	99 %	The invention concerns a continuous method for treating a lignocellulosic biomass before enzymatic hydrolysis, said method comprising a transfer of crushed then pressed biomass to a step of impregnation by an acid liquor, the impregnated biomass dripping over the area containing the impregnation liquor, then the resulting wet biomass is pressed and sent to a steam explosion step. The impregnation liquor is prepared in a dedicated area from the used liquor from the dripping operation and/or that from the pressing operation, prior to the explosion step. The invention also concerns the facility for implementing the method. 
13.	Method for converting lignocellulosic biomasses into mono- or poly-oxygenated molecules	EP2984095	2016-02-17	IFP ENERGIES NOUVELLES	99 %	The invention relates to a method for converting lignocellulosic biomass or cellulose into mono- or poly-oxygenated compounds, in which the lignocellulosic biomass or cellulose is placed in contact simultaneously with a catalytic system including a combination of one or more homogeneous catalysts and one or more heterogeneous catalysts, in a single reaction chamber, in the presence of at least one solvent, said solvent being only water or water mixed with at least one other solvent, in a reducing atmosphere, at a temperature of 80 °C to 250 °C and at a pressure of 0.5 MPa to 20 MPa. 
14.	Continuous counter-current organosolv processing of lignocellulosic feedstocks	EP2150572	2010-02-10	SUZANO CANADA LIGNOL INNOVATIONS	99 %	A modular process for organosolv fractionation of lignocellulosic feedstocks into component parts and further processing of said component parts into at least fuel-grade ethanol and four classes of lignin derivatives. The modular process comprises a first processing module configured for physico-chemically digesting lignocellulosic feedstocks with an organic solvent thereby producing a cellulosic solids fraction and a liquid fraction, a second processing module configured for producing at least a fuel-grade ethanol and a first class of novel lignin derivatives from the cellulosic solids fraction, a third processing module configured for separating a second class and a third class of lignin derivatives from the liquid fraction and further processing the liquid fraction to produce a distillate and a stillage, a fourth processing module configured for separating a fourth class of lignin derivatives from the stillage and further processing the stillage to produce a sugar syrup. 
15.	Process for converting cellulose or lignocellulosic biomass using catalysts based on tin oxide and/or on antimony oxide and on a metal selected from groups 8 to 11	EP2655302	2013-10-30	CNRS - CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE IFP ENERGIES NOUVELLES UNIVERSITE CLAUDE BERNARD LYON 1	99 %	The invention relates to a process for converting cellulose or lignocellulosic biomass using heterogeneous catalysts based on antimony and/or tin oxide, dispersed on a support and containing at least one particular element in the metallic state. The use of these catalysts makes it possible to directly obtain exploitable products, in particular hydroxyacetone and propylene glycol with high selectivity.

16.	Method for producing solutions of sugars and alcohols from lignocellulosic biomass with complementary treatment of the solid residue by a hydrated inorganic salt	EP2931909	2015-10-21	IFP ENERGIES NOUVELLES	99 %
The invention relates to a method for producing solutions of sugars and alcohols from lignocellulosic biomass, comprising a pre-treatment, a step of enzymatic hydrolysis and alcoholic fermentation, a step of extracting the alcohol produced, a step of separating the solid residue, and optionally a step of washing and drying, followed by a step of baking the solid residue in a medium comprising at least one hydrated inorganic salt of formula $MX_n \cdot n'H_2O$, wherein M is a metal selected from the groups 1 to 13 of the periodic classification, X is an anion, n is a whole number between 1 and 6, and n' is between 0.5 and 12, enabling a solid fraction and a liquid fraction to be obtained, said solid fraction being then separated and subjected to either an enzymatic hydrolysis step, or steps of enzymatic hydrolysis and alcoholic fermentation.					
					
17.	Process for converting lignocellulosic or cellulose biomass via solid lewis acid catalysts based on tungsten oxide and on a metal chosen from groups 8 to 11	EP2598239	2013-06-05	CNRS - CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE IFP ENERGIES NOUVELLES UNIVERSITE CLAUDE BERNARD LYON 1	99 %
The invention relates to a process for converting lignocellulosic or cellulose biomass using heterogeneous catalysts based on tungsten oxide dispersed on a support based on oxides, preferably based on oxide(s) of aluminium and/or of zirconium and/or of titanium and/or of niobium and containing an element in the particular metal state. The use of these catalysts makes it possible to directly obtain upgradable products containing three carbon atoms, in particular hydroxyacetone and propylene glycol with high selectivity.					
18.	Method for treating lignocellulosic biomass	WO2019/120995	2019-06-27	AGRO INDUSTRIES RECHERCHE & DEVELOPPEMENT IFP ENERGIES NOUVELLES INRA - INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE	99 %
The invention concerns a method for treating lignocellulosic biomass, said method comprising the following steps: a. Preparing an impregnation liquor (4) containing a chemical catalyst intended to impregnate the biomass b. Introducing the crushed biomass (6) through an inlet of an impregnation reactor (5), said inlet being situated in a first impregnation area (5a) of said impregnation reactor that comprises two superposed areas, said first impregnation area and a second so-called dewatering area (5b) above the impregnation area c. Introducing the liquor (4a) through a first liquor inlet situated in said first impregnation area (5a) of the reactor, d. Introducing said liquor (4b) into said reactor through a second liquor inlet in another area of the reactor (5d) situated below the biomass inlet in the first impregnation area (5b). The invention also concerns the facility for implementing the method.					
					

19.

Method and system for fractionation of lignocellulosic biomass

EP2483331

2012-08-08

NOVA PANGAEA TECHNOLOGIES

NOVA PANGAEA TECHNOLOGY

99 %

Methods and systems for fractionating **lignocellulosic biomass** including hemicellulose, cellulose and **lignin**, including exploding the **biomass** cells to devolatilize the **biomass**, hydrolyzing the hemicellulose to produce a liquid component including hemicellulosic sugars and a solid component including less than 10% hemicellulose, separating the liquid and solid components, vaporizing the cellulose in the solid component, and condensing the cellulosic sugar vapors. The methods and systems may vaporize the cellulose in a continuous steam reactor at a temperature of about 400 - 550 0C and a pressure of about 1 - 3 bara. Electromagnetic and/or electroacoustic **treatment** such as ultrasound and/or microwave **treatment** may be applied to the **biomass** immediately before or during cellulose hydrolysis.

20.

Two-stage continuous pre-treatment of lignocellulosic biomass

EP2737123

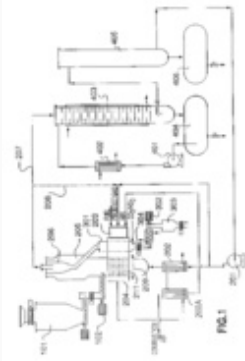
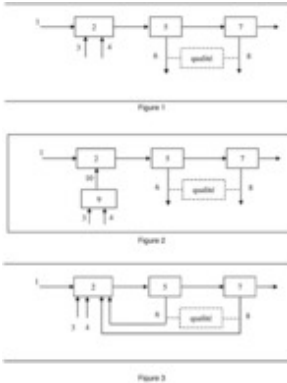
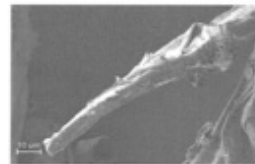
2014-06-04

GREENFIELD SPECIALTY ALCOHOLS

GREENFIELD ETHANOL

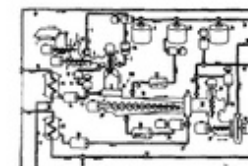
99 %

Disclosed is a method of pretreating **biomass** in two pretreatment stages as part of a biofuel production process. The first stage pretreatment is carried out by **heating** the **biomass** to a first stage temperature of 140°C to 180°C for a first stage time of 30 minutes to 2 hours at a first stage pressure of 105 to 150 psig; and the second stage is carried out by **heating** the **biomass** to a second stage temperature of 190°C to 210°C for a second stage time of 2 to 10 minutes at a second stage pressure of 167 to 262 psig. The **biomass** may be initially conditioned prior to the first pretreatment stage by atmospheric steam **heating** and adjusting the moisture content of the **biomass**. Hemicellulose and inhibitors (inhibitory compounds) to downstream hydrolysis and fermentation are preferably removed between the first and second pretreating stages, more preferably after each pretreatment stage.

21.	Energy efficient liquefaction of biomaterials by thermolysis	EP0904335	1999-03-31	DYNAMOTIVE ENERGY SYSTEMS DYNAMOTIVE TECHNOLOGIES LIN RICHARD RTI RESOURCE TRANSFORMS INTERNATIONAL	99 %	A thermolysis process for the production of volatiles for an external combustor (203) or liquefaction of biomass solids in which specific and previously unrecognized conditions are employed. The thermolysis is carried out in a single deep fluidized bed (211) of inert material operating at near atmospheric pressure, relatively low temperature, long solids and gas residence times and moderate heating rates. The distribution of the thermolysis products among solid (char) and gases under these conditions is unique. The product effluent can be either quenched to produce a high liquid yield in addition to a low char yield or the volatile effluent can be used in either the same combustor (203) or a second combustor (310) to produce heat energy a particularly high efficiency system. In using a quencher (403), the quenched liquid is of similar composition to those obtained by so called fast pyrolysis procees of the prior art. The specified conditions are such as to allow production of liquids in high yields in an energy efficient manner. The low severity of the conditions in comparison with previous approaches allows simplified process design and scale-up leading to lower capital and operating costs as well as easier control. 
22.	Method for treating lignocellulosic biomass by impregnation	WO2019/120994	2019-06-27	AGRO INDUSTRIES RECHERCHE & DEVELOPPEMENT IFP ENERGIES NOUVELLES INRA - INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE	99 %	The invention relates to a method for treating lignocellulosic biomass by means of acid liquor in order to produce second-generation (2G) sugary juices. These sugary juices can be used to produce other products via the biochemical route (for example: alcohols such as ethanol or butanol, or other molecules, for example solvents such as acetone, etc.). This method comprises the analysis of the liquid streams drawn off during the method and the adjustment of the composition of the impregnation liquor so as to keep the acid power of said streams constant. 
23.	Process for thermal-mechanical pretreatment of biomass	WO2011/044282	2011-04-14	BLUE SUGARS SK ENERGY	99 %	(WO2011/044292) Disclosed is a process for the thermal-mechanical pretreatment of biomass. The process includes subjecting a biomass feedstock including fibers containing cellulose, hemicellulose and lignin, to thermal reaction under conditions exceeding atmospheric pressure, at a temperature exceeding ambient temperature, at a predetermined moisture content and for a predetermined amount of time. Subsequently, the pressure of said thermal reaction is reduced under conditions resulting in explosive decompression of said biomass. The decompressed biomass is then subjected to axial shear forces to mechanically reduce the size of the fibers of the biomass to obtain treated biomass. The resultant treated biomass has a high level of enzymatic digestability and a low concentration of degradation products. 

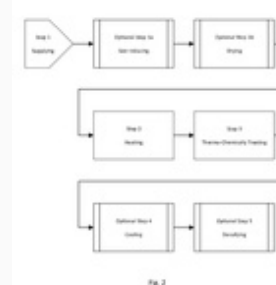
24. Process allowing the delignification and the transformation into sugar of **lignocellulose** vegetal materials by using organic solvents WO79/00119 1979-03-22 99 %
- THERMOFORM BAU & FORSCHUNGSGESELLSCHAFT
BAU & FORSHUNGSGESELSHAFT TE
CHANG PEI CHING
CHANG, PEI-CHING
PASZNER L
5 more...

Minced **lignocellulose**, such as wood, straw, bamboos, bagasse or any other structured vegetal material, is **treated** in a discontinuous or continuous process. The process consists in boiling this material in an acidified mixture of solvents in an aqueous phase. This mixture of solvents contains water in a proportion of 30 to 70 parts and an organic solvent in a proportion of 70 to 30 parts. The organic solvent consists of either an alcohol of light molecular weight, or a ketone of light molecular weight; it must be easily evaporable and soluble in water. The pH of the medium is adjusted to a pH from 3.5 to 1.7 by adding a catalytic compound selected within the group of the strong acids: hydrochloric, nitric and phosphoric; within the group of these strong acids neutralized by their neutral salts; within the group of the following organic acids: oxalic, maleic, o-phthalic, l-malic, succinic, nicotinic, salicylic and trifluoroacetic. The boiling temperatures range between 160 and 210 C, preferably between 180 and 200 C. After three minutes at the minimum, we obtain the separation of the **lignin** and the hydrolysis of the hemicelluloses dissolved; after that, the fibres are easily dispersible while forming a pulp. By proceeding to a mechanical refining at a high pressure, a high density **thermomechanical** pulp is obtained after a shorter boiling time. With the neutralized acids, as well as with the organic acids, particularly with the oxalic acid, we can obtain a fibre with a high degree of polymerization. The **lignin** is obtained as a precipitate which separates from the liquid; the liquid solvent, usually ethanol or acetone, is evaporated; then the drained **lignin** is redissolved in the minimal quantity of acetone; a new precipitation with an excess of water allows to obtain the **lignin** in the form of a slightly coloured powder. A prolonged boiling dehydrates and disaggregates the sugars; by the strong acids action, takes place the formation of light molecular weight or microcrystalline cellulose, glucose or organic acids, methanol and furfuralic compounds.



25. Improved process for the **thermo-chemical treatment of biomass** using controlled application of oxygen EP3280786 2018-02-14 99 %
- DE GROOT KLAAS PIETER HENDRIK
VAN EXEL ROLAND ALEXANDER
VAN MEIJEL HENRICUS PETER MARIE

The present invention relates to a process for **thermo-chemical treatment of biomass**, said process comprising the following steps: Step 1) supplying **biomass**; Step 2) **heating** said **biomass** obtained in step 1) to a predetermined temperature T_h to obtain a **heated biomass**; and Step 3) the **thermo-chemically treatment** of said **heated biomass** obtained in step 2) at a temperature T_t between a minimal **treatment** temperature T_{tmin} and a maximum **treatment** temperature T_{tmax} wherein $T_h < T_{tmin}$ by supplying a controlled flow of oxygen to said **biomass** during at least part of said **treatment** to obtain a **thermo-chemically treated biomass**; Step 4) optionally cooling said **thermo-chemically treated biomass** obtained in step 3) to a cooled temperature T_c in order to obtain a solid fuel and to the solid fuel thus obtained.



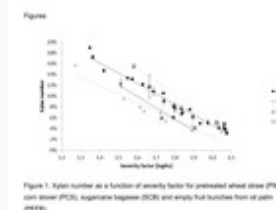
26. Efficient **lignocellulose** hydrolysis with integrated enzyme production EP2471940 2012-07-04 99 %
- CLARIANT
CLARION PRODUCTS

The present invention provides a process for degradation of **lignocellulosic biomass**, which has optionally been pretreated. It is based on the finding that hydrolysis efficiency of the **biomass** is enhanced in the presence of a mechanically or chemically **treated** microorganism capable of producing the respective hydrolytic enzymes. The invention therefore provides a process for degradation of **lignocellulosic biomass** with integrated produced enzyme cocktails. The invention also provides a process wherein the part of the optionally pre-**treated lignocellulosic biomass** is incorporated into the final growth medium of the fungus.



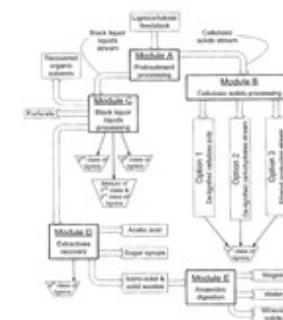
27.	Methods of processing lignocellulosic biomass using single-stage autohydrolysis pretreatment and enzymatic hydrolysis	EP3027757	2016-06-08	INBICON INBICON A	99 %
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A method of processing **lignocellulosic biomass** comprising: - Providing soft **lignocellulosic biomass** feedstock, - Pretreating the feedstock at pH within the range 3.5 to 9.0 in a single-stage pressurized hydrothermal pretreatment to log severity Ro 3.75 or lower so as to produce a pretreated **biomass** slurry in which the undissolved solids comprise at least 5.0% by weight xylan, and Hydrolysing the pretreated **biomass** with or without addition of supplemental water content using enzymatic hydrolysis for at least 24 hours catalysed by an enzyme mixture comprising endoglucanase, exoglucanase, beta-glucosidase, endoxylanase, and beta-xylosidase activities at activity levels in nkat/g glucan of endoglucanase of at least 1100, exoglucanase of at least 280, beta-glucosidase of at least 3000, endoxylanase of at least 1400, and beta-xylosidase of at least 75, so as to produce a hydrolysate in which the yield of C5 monomers is at least 55% of the original xylose and arabinose content of the feedstock prior to pretreatment.



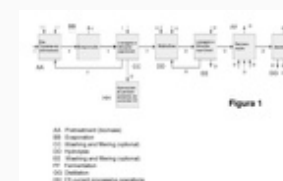
28.	Derivatives of native lignin	EP2435453	2012-04-04	SUZANO CANADA FIBRIA INNOVATIONS LIGNOL INNOVATIONS PAULA	98 %
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The present invention provides derivatives of native **lignin** having an aliphatic hydroxyl content of 2.35 mmol/g or less Surprisingly, it has been found that consistent and predictable antioxidant activity may be provided by selecting for derivatives of native **lignin** having a certain aliphatic hydroxyl content.



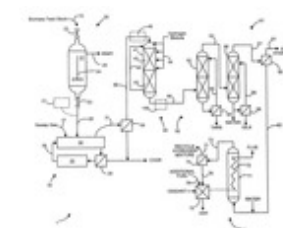
29.	Process for producing one or more alcohols from lignocellulosic raw material	WO2015/172220	2015-11-19	INBICON ODEBRECHT AGROINDUSTRIAL	98 %
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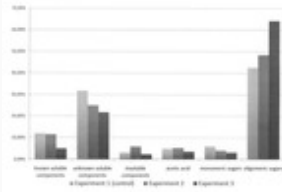
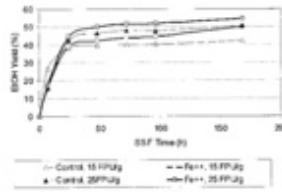
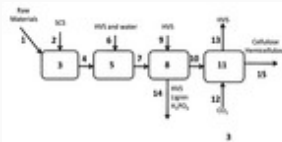
The present invention relates to a process for producing alcohol from **lignocellulosic** raw material, comprising the re-use of a sugar current originating from the actual process, or from another alcohol-producing process, for solubilizing an alkaline mixture comprising lime and, optionally, other pH adjusting agents for improving pH control efficiency.



30.	Process for thermochemical conversion of biomass	EP2403926	2012-01-11	G4 INSIGHTS	98 %
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The present invention provides a system and method for converting **biomass** into fluid hydrocarbon products to minimize the use of fossil fuels, provide energy and chemical feedstock security, and sustainable and/or carbon neutral electric power. One disclosed embodiment comprises performing fast pyrolysis on **biomass** to produce pygas and char using a maximum processing temperature of about 650 °C. The pygas is provided to an independent reactor without the addition of an oxidizing agent for catalytically converting the pygas to hydrocarbons using a maximum processing temperature of about 650 °C. The present invention also concerns a system comprising fast pyrolysis means producing a pygas and char, independent catalytic conversion means downstream of the fast pyrolysis for converting the pygas to hydrocarbons, and a hydrogen source, external to the system and/or produced by a steam reformer by steam reformation of at least a portion of the hydrocarbons, coupled to catalytic conversion means.



31.	Improved pre-soaking process for biomass conversion	EP2610346	2013-07-03	VERSALIS BETA RENEW BELBS BETA RENEWABLE BETA RENEWABLES BETA RENEWABLES SOTIETHA PELLATHIONI BETA RENEWABLES S P A 1 more...	98 %	
An improved method of conducting the pre-soaking step involving pre-soaking the lignocellulosic biomass in a liquid (water) at a temperature in the range of between 100°C to 150°C prior to soaking at higher temperatures. This material can then be soaked and soaked liquid filtered by nano-filtration. When nano-filtration is used, the pre-soak temperature can be in the range of 10°C to 150°C.						
32.	Ethanol production with dilute acid hydrolysis using partially dried lignocellulosics	EP1307575	2003-05-07	ALLIANCE FOR SUSTAINABLE ENERGY DU PONT DE NEMOURS MIDWEST RESEARCH INSTITUTE	98 %	
a) acid-soaking, draining and dewatering a lignocellulosic biomass; b) first-stage hydrolysis at a temperature of from 130 DEG C to 220 DEG C and flashing hydrolysate in two consecutive tanks; c) recovering soluble sugars by a counter-current extractor; d) second-stage acid and metal salt impregnation and dewatering of washed-first stage solids; e) second-stage hydrolysis at a temperature from 190 DEG C to 240 DEG C and flashing hydrolysate in two consecutive tanks; f) first-stage fermentation of extract promoting yeasts growth; g) fermentation of second-stage hydrolysate and recovering the alcohol						
33.	Method and apparatus for lignocellulose pretreatment using a super-cellulose-solvent and highly volatile solvents	EP3205672	2017-08-16	VIRGINIA TECH INTELLECTUAL PROPERTIES PANASONIC ELECTRIC WORKS VIRDZHINIJA TEK INTELEKCHUEHL PROPERTIZ INK	98 %	
Embodiments of the present invention overcome the well-known recalcitrance of lignocellulosic biomass in an economically viable manner. A process and a system are provided for the efficient fractionation of lignocellulosic biomass into cellulose, hemicellulose, and lignin. The cellulose and hemicellulose thus obtained are highly amorphous and can be readily converted into highly concentrated mixtures of five and six carbon sugars using known methods. Typical yields of sugars exceed 100 grams of sugars per liter of sugar solution. Other products, such as alcohols, can easily be prepared according to methods of the invention. The modest process conditions and low solvent/solid ratios of some embodiments of the invention require relatively low capital and processing costs.						

34.

Method for preparing **lignocellulosic biomass** for producing biorefining products, in particular ethanol, and an apparatus for carrying out this method

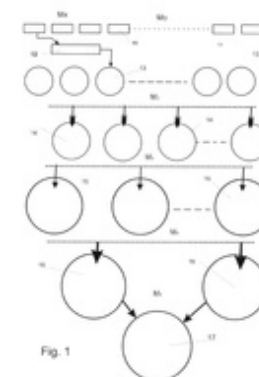
WO2016/026058

2016-02-25

ABI TRADING SÄRL

98 %

The invention relates to an apparatus (10) comprising means for pretreating said organic products in order to produce said **lignocellulosic biomass**, a device for carrying out all the steps of the method on predetermined batches, in units suitable for said batches. The means for pretreating said organic products to produce said **lignocellulosic biomass** comprise at least one mixing and cooking vessel (13) for preparing a mixture of organic products, in particular of wood particles having a volume of water of between 75 and 90% by mass of the mixture, and for pressure cooking said mixture. Said apparatus comprises at least one expansion tank (14) for discharging the water vapour and recovering a pasty mass, at least one pre-hydrolysis or complementary **treatment** vessel (15) for **treatment** with a view to liquefying said molasses by cutting the molecular chains in order to form a **biomass** rich in C5 and C6 sugars, said different units being arranged upstream of at least one fermentation vessel (16), which is followed by at least one distillation column (17).



35.

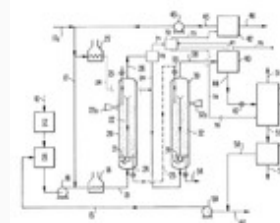
Direct **biomass** hydroliquefaction process comprising two ebullated bed hydroconversion steps

2011-07-27

IFP ENERGIES NOUVELLES

98 %

Hydroliquefaction of **biomass** including algae, **lignocellulosic biomass** and/or at least one constituent of **lignocellulosic biomass** including cellulose, hemicellulose and/or **lignin** for producing fuel bases comprises: (a) stage of preparation of suspension of particles of **biomass** in solvent; (b) first stage of hydroconversion in presence of hydrogen of suspension in at least one reactor containing ebullating bed catalyst; and (c) second stage of hydroconversion in the presence of hydrogen of a proportion of effluent in at least one reactor containing ebullating bed catalyst. Hydroliquefaction of **biomass** including algae, **lignocellulosic biomass** and/or at least one of constituent of **lignocellulosic biomass** including cellulose, hemicellulose and/or **lignin** for producing fuel bases comprises: (a) a stage of preparation of a suspension of particles of **biomass** in a solvent, preferably a hydrogen donor solvent: (b) a first stage of hydroconversion in the presence of hydrogen of the suspension in at least one reactor containing an ebullating bed catalyst and operating at 300-440[deg] C, at a total pressure of 15-25 MPa, at an hourly mass velocity of 0.1-5 per hour and at a hydrogen/feed ratio of 0.1- 2 Nm ³/ kg; and (c) a second stage of hydroconversion in the presence of hydrogen of at least a proportion of the effluent obtained in stage (b) in at least one reactor containing an ebullating bed catalyst and operating at 350-470[deg] C, at a total pressure of 15-25 MPa, at an hourly mass velocity of 0.1-5 per hour and a hydrogen/feed ratio of 0.1-2 Nm ³/kg.



36.

Method for the rapid pyrolysis of **lignocellulose**

EP1913116

2008-04-23

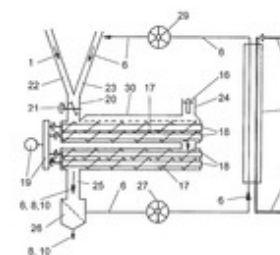
KARLSRUHER INSTITUTE FUER TECHNOLOGIE

FORSCHUNGSZENTRUM KARLSRUHE

KARLSRUHE INSTITUTE OF TECHNOLOGY

98 %

Disclosed is a method for rapidly pyrolyzing **lignocellulose**. The aim of the invention is to create an improved rapid **lignocellulose** pyrolysis method which above all substantially reduces the risk of the pyrolysis condensate and the pyrolysis coke being accidentally contaminated by dust. Said aim is achieved by a method comprising the following steps: the **lignocellulose** (1) is mechanically reduced (2) to **lignocellulose** particles (3); the **lignocellulose** particles (3) are completely dried and/or preheated; the **lignocellulose** particles are mixed (5) with **heat** transferring particles so as to obtain a mixture, said **heat** transferring particles (6) being **heated** to a temperature ranging between 500 °C and 650 °C before being mixed; and the **lignocellulose** particles are **heated** without oxygen by means of the **heat** transferring particles in a pyrolysis reactor. During said last step, a temperature ranging between 400 °C and 600 °C is obtained for one to 50 seconds while the **lignocellulose** particles react to pyrolysis coke (8), pyrolysis condensate (9), and pyrolysis gas (11).



37.

Lignocellulosic biomass fermentation process co-product ash for land applications

EP3055277

2016-08-17

SUSTAINABLE TECHNOLOGY

DU PONT DE NEMOURS

98 %

A composition that is useful in land surface applications is produced from ash resulting from burning at least one of lignocellulosic filter cake and lignocellulosic syrup co-products of a lignocellulosic biomass fermentation process for production of ethanol. The composition can be applied to surfaces such as fields, roads, and landfills as a stabilizer and/or fertilizer. Burning of material to produce the ash provides thermal energy.

Element	Ash Type			Data Source
	Cyclone	Baghouse	Clinker	
Al	0.89%	0.53%	2.99%	AEI-ICP
Ba	0.02%	0.04%	0.05%	AEI-ICP
C	3.20%	2.89%	0.61%	CHN
Ca	33.45%	13.34%	18.36%	AEI-ICP
Cr	BDL	BDL	BDL	AEI-ICP
Fe	0.80%	0.64%	0.83%	AEI-ICP
H	0.23%	0.09%	0.04%	CHN
K	2.64%	12.22%	5.12%	AEI-ICP
Li	BDL	BDL	BDL	AEI-ICP
Mg	1.48%	0.91%	1.14%	AEI-ICP
Mn	BDL	BDL	BDL	AEI-ICP
Mo	BDL	BDL	BDL	AEI-ICP
N	0.00%	0.00%	0.00%	CHN
Na	1.95%	16.86%	2.42%	AEI-ICP
Ni	43 ppm	BDL	55 ppm	AEI-ICP
P	0.79%	0.63%	0.64%	AEI-ICP
S	2.15%	4.12%	1.52%	AEI-ICP
Si	10.28%	5.41%	21.39%	AEI-ICP
Sr	BDL	BDL	BDL	AEI-ICP

38.

Soil conditioner compositions containing lignocellulosic biomass fermentation process syrup

EP3055275

2016-08-17

SUSTAINABLE TECHNOLOGY

DU PONT DE NEMOURS

98 %

Syrup produced in a lignocellulosic biomass fermentation process is used as a binder for soil conditioning materials to make an agricultural composition that is easily handled and applied. The syrup binds powdery soil conditioning materials such as lime and gypsum to form pellets or granules.

Spezyme®

39.

Method for the conversion of lignocellulosic biomasses into mono-oxygenated or poly-oxygenated molecules

WO2015/004369

2015-01-15

IFP ENERGIES NOUVELLES

98 %

The invention relates to a method for the conversion of lignocellulosic or cellulosic biomass, simultaneously using an original combination of at least two homogeneous catalysts and at least one heterogeneous catalyst. The use of said catalysts allows the direct production of mono-oxygenated or poly-oxygenated recoverable products and the restriction of the formation of non-recoverable products. The term non-recoverable products is used to mean soluble and non-soluble humins, i.e. high-molecular-weight products created from unwanted condensation reactions of sugars and the derivatives thereof.

$$\text{Reduced} = \frac{\text{C10 (g/L)}}{\text{Catalyst (g/L)}} \times \frac{n \text{ M/C (g/mol)}}{\text{M/C (g/mol)}}$$

40.

Method and device for thermochemically converting organic substances into a high-quality organic product

EP1910499

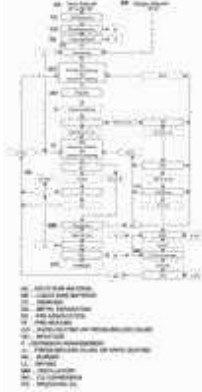
2008-04-16

DEMIR YAVER

DEMIR, YAVER

98 %

The invention relates to a method for thermochemically directly converting educts containing high-molecular weight organic components into low-molecular weight products containing flammable liquid at room temperature organic products. The inventive method consists in heating and hydrogenating the educts for carrying out a liquid phase thermal conversion reaction in such a way that a reaction three-phase mixture is obtained. The first phase, separated from the liquid phase, comprises a component catalysing the conversion reaction and is returned at least partially to the liquid phase and the second phase comprises a certain proportion of low-molecular weight and liquid at room temperature organic products which are devoid of or poor in heteroatoms. Said invention also relates to carrying out the inventive method in a device, which is provided with two heated and pressurised reactors (RI, RII) and comprises a phase-separation unit for separating reaction phases. Said reactors (RI, RII) are fluidly connected in such a way that the separated phase containing catalysing components is returned to the reactor (RI) by means of a recycling device. The highly-volatile component-containing phase is transferable from the first (RI) to second (RII) reactor.



13/33

41.

Process for producing sugar solutions from lignocellulosic biomass with supplementary treatment of the solid residue with a hydrated inorganic salt

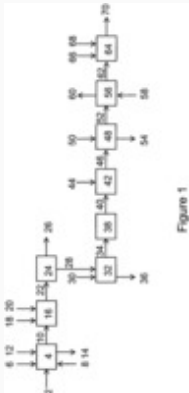
WO2014/091104

2014-06-19

IFP ENERGIES NOUVELLES

98 %

The present invention describes a process for producing sugar solutions from **lignocellulosic biomass**, comprising a pretreatment, an enzymatic hydrolysis step, a step of separation of the solid residue, and a washing and optionally drying step, followed by a step of cooking the solid residue in a medium comprising at least one hydrated inorganic salt of formula $MX_n.n'H_2O$, in which M is a metal chosen from groups 1 to 13 of the Periodic Table, X is an anion and n is an integer between 1 and 6, with n' being between 0.5 and 12, making it possible to obtain a solid fraction and a liquid fraction, said solid fraction being subsequently separated and subjected to a second enzymatic hydrolysis step.



42.

Processing materials

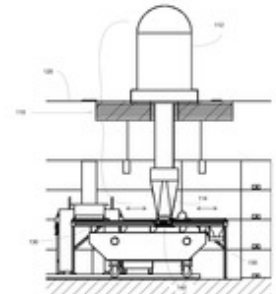
EP2888035

2015-07-01

XYLECO
INC XYLECO

98 %

(EP2888605)
Materials, such as **biomass** feedstocks (e.g., plant **biomass**, animal **biomass**, and municipal waste **biomass**) are processed to produce useful products, such as fuels. Conveying systems, such as flowing gas conveying systems and such as closed-loop flowing gas conveying systems are described. Many potential **lignocellulosic** feedstocks are available today, including agricultural residues, woody **biomass**, municipal waste, oilseeds/cakes and seaweed, to name a few.



43.

Pretreatment of lignocellulosic biomass with sulfur dioxide and/or sulfurous acid

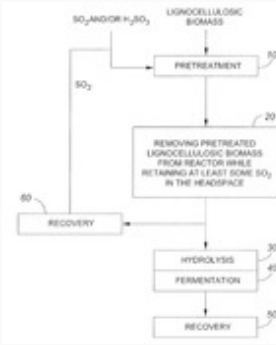
WO2017/136915

2017-08-17

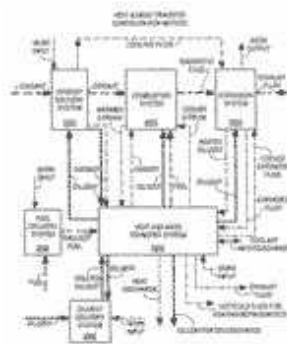
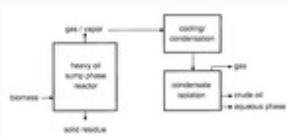
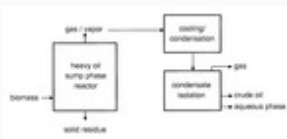
IOGEN

98 %

A process for hydrolyzing **lignocellulosic biomass** includes feeding **lignocellulosic biomass** into a pretreatment reactor, wherein the pretreatment reactor has a headspace charged with sulfur dioxide previously used in the pretreatment of **lignocellulosic biomass**. In addition, acid comprising sulfur dioxide and/or sulfurous acid is fed into the pretreatment reactor (e.g., with the **lignocellulosic biomass**, separate from the **lignocellulosic biomass**, or a combination thereof) and the **lignocellulosic biomass** is heated. As the pretreated **lignocellulosic biomass** is discharged from the pretreatment reactor, at least a portion of the sulfur dioxide used in the pretreatment is retained in the headspace.



44.	Method and apparatus for the treatment of lignocellulosic biomasses	EP3450622	2019-03-06	WATER & SOIL REMEDIATION	98 %
A method for the treatment of a lignocellulosic biomass, preparatory for the subsequent transformation of celluloses into simple sugars by means of processes such as enzyme hydrolysis.					
Fig. 1					
45.	Pretreatment with lignosulfonic acid	WO2019/191828	2019-10-10	IOGEN	98 %
A process for converting lignocellulosic biomass to glucose or ethanol includes subjecting the lignocellulosic biomass to a lignosulfonic acid pretreatment, wherein the lignosulfonic acid has a concentration of sulfonate groups in acid form that is greater than 0.02 mol/L and a total amount of sulfur dioxide is greater than 15 wt% based on dry weight of lignocellulosic biomass.					
Figure 5					
46.	System and method for preextraction of hemicellulose through using a continuous prehydrolysis and steam explosion pretreatment process	EP2247781	2010-11-10	ANDRITZ	98 %
A system has been developed for pretreating cellulosic biomass feed stock including: a first pressurized reactor receiving the feed stock, wherein the feed stock undergoes hydrolysis in the first pressurized reactor; a sealing device having a first pressurized coupling to a feedstock discharge port of the first pressurized reactor, and a second pressurized coupling to a second pressurized reactor; a drain for a liquid including dissolved hemi-cellulosic material extracted from the feed stock in at least one of the first pressurized reactor and the sealing and extraction device; the second pressurized reactor assembly receiving the pressurized feed stock from the sealing device at a pressure substantially greater than the pressure in the first pressurized reactor, wherein cells of the feed stock are infused with water in the second pressurized reactor, and an expansion device downstream of the second pressurized reactor assembly, wherein the expansion device rapidly releases the pressure of the feed stock discharged from the second pressurized reactor such that the feed stock undergoes a steam explosion reaction.					
47.	Systems and methods for converting lignocellulosic biomass to concentrated sugars	WO2015/050881	2015-04-09	TEXAS A & M UNIVERSITY	98 %
Various systems and methods are provided for converting lignocellulosic biomass (102) to concentrated sugars (104). For example, a saccharification process includes obtaining lignocellulosic biomass (102) and converting the lignocellulosic biomass (102) into sugars (104). The lignocellulosic biomass (102) is converted into sugars (104) by flowing the lignocellulosic biomass (102) countercurrently to a flow of water through a saccharification vessel having a column (302) and converting the lignocellulosic biomass (102) into a sugar solution using an enzyme in the column (302).					
FIGURE 1					

48.	Thermodynamic cycles using thermal diluent	EP1585889	2005-10-19	VAST HOLDINGS VAST POWER PORTFOLIO VAST POWER SYSTEMS VAST POWER SYSTEMS UNITED STATES INDIANA 4 6 5 1 7 4 0 0 8 EL QUARTO SOUTH SEVENTEEN STREET 2 8 2 4 VASTO POWER SYSTEMS	98 %	
49.	Thermochemical conversion of biomass	EP2445990	2012-05-02	NEXXOIL HOCHSCHULE FUER ANGEWANDTE WISSENSCHAFTEN HAMBURG HAW HAMBURG HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN HAMBURG	98 %	
50.	Process for converting cellulose or lignocellulosic biomass using stable non-zeolite solid lewis acids based on tin or antimony alone or as a mixture	EP3224231	2017-10-04	CNRS - CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CENTRE NAC DE LA RECHERCHE SCIENTIFIC IFP ENERGIES NOUVELLES UNIVERSITE CLAUDE BERNARD LYON 1	98 %	

The invention relates to a method for producing crude oil from **biomass** by direct liquefaction under atmospheric pressure, involving the following steps: introducing dried **biomass** into a reactor containing heavy oil to form a sump oil phase consisting of **biomass** and heavy oil; maintaining the temperature of the sump oil phase at a predetermined reaction temperature; condensing and collecting the volatile reaction products; and isolating and collecting the crude oil. Said method is characterized in that the heavy oil phase has at least 5 wt.% organically bound oxygen.

The invention relates to a process for converting cellulose or **lignocellulosic biomass** using tin- and/or antimony-based stable non-zeolite heterogeneous catalysts, preferably dispersed on a support. The use of these catalysts makes it possible to directly obtain lactic acid with high selectivity while at the same time limiting the production of soluble polymers and oligosaccharides.

$$C = 100 * C_{\text{solubilisé}} / C_{\text{initial}}$$

51.

Processing biomass

EP2069423

2009-06-17

XYLECO

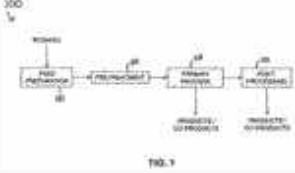
KSILKO INK

MARSHALL MEDOFF

PROXY RECORDS

98 %

Biomass (e.g., plant **biomass**, animal **biomass**, and municipal waste **biomass**) is processed to produce useful products, such as fuels. For example, systems are described that can use feedstock materials, such as cellulosic and/or **lignocellulosic** materials, to produce ethanol and/or butanol, e.g., by fermentation.



52.

Method for dilute acid pretreatment of lignocellulosic feedstocks

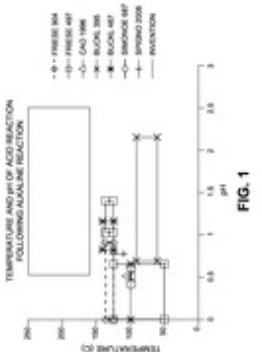
WO2012/019305

2012-02-16

IOGEN ENERGY

98 %

The present invention relates to a process for the conversion of a **lignocellulosic** feedstock involving acid pretreatment. The process comprises the steps of **treating** the **lignocellulosic** feedstock with alkali at a pH of between about 8.0 and about 12.0 so as to dissolve acetyl groups present on said **lignocellulosic** feedstock, while converting less than about 10% of the xylan present in the **lignocellulosic** feedstock to xylose and less than about 10% of the cellulose to glucose, thereby producing an alkali conditioned feedstock. The alkali conditioned feedstock is then pretreated at a temperature of about 160°C to about 250°C, at a pH of about 0.5 to about 2.5 for about 0.5 to about 10 minutes so as to hydrolyze about 80 to 100% of the xylan and about 3 to about 15% of the cellulose to produce an acid pretreated feedstock comprising cellulose. The cellulose in the pretreated feedstock can be hydrolyzed to glucose with cellulase and the glucose can be fermented to produce a fermentation product.



53.

Pretreatment of densified biomass using liquid ammonia and systems and products related thereto

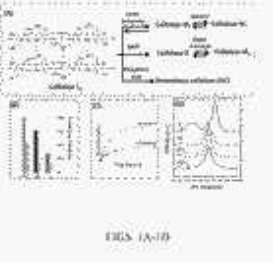
US20180258190

2018-09-13

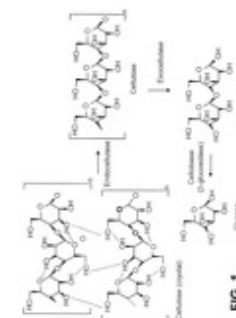
MICHIGAN STATE UNIVERSITY

98 %

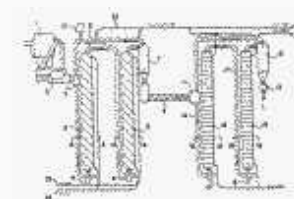
A method to convert at least a majority of native cellulose I β to cellulose III β in pretreated or untreated densified **biomass** is disclosed. The densified **biomass** (cellulosic or **lignocellulosic**) is pretreated with anhydrous liquid ammonia or liquid ammonia comprising a solution of at least 80% ammonia. The pretreating can be performed at a temperature from about 4° C. to about 140° C. and a pressure from about 14.7 to about 200 psi. In one embodiment, the densified cellulosic converting pretreatment process is followed by **lignin** extraction (LE). The total moisture content of the densified **biomass** and the solution is 30% or less and a weight ratio of liquid ammonia to the densified **biomass** is from about 0.3:1 to about 2:1. Various products and systems are also disclosed.



This invention relates to a method of saccharifying **lignocellulosic** material, the method comprising: providing in a vessel, a slurry comprising a **lignocellulosic** material, water, and an enzyme, the slurry having greater than 20 weight percent solids; and drawing slurry material from the vessel and jetting the slurry material into the vessel, while saccharifying at least a portion of the **lignocellulosic** material, producing a sugar.



An energy efficient process for hydrolysing **lignocellulosic** materials which comprises using a primary system by providing a start-up energy input to operating saturated steam conditions and thereafter operating the primary system with substantially constant energy input, the condition of the hydrolysing saturated steam being controlled by water injection and/or steam bleeding from the primary system. The dwell time of the solids stream in the primary system is controlled by controlling its passage with flashing off of steam into a secondary system where drying occurs together with some small measure of hydrolysis in a lower pressure superheated steam environment, there being an energy input into the secondary system using steam bled from the primary system. The output solids material stream is preferably capable of being self polymerised into a formed shape eg a board.



A process for the production of glucose and ethanol from a pretreated **lignocellulosic** feedstock is provided. The method comprises enzymatically hydrolyzing the pretreated **lignocellulosic** feedstock with cellulase enzymes to produce a hydrolyzate slurry comprising glucose and unhydrolyzed cellulose and fermenting the hydrolyzate slurry in a fermentation reaction to produce a fermentation broth comprising alcohol. A process stream is obtained comprising unhydrolyzed cellulose, which is then subjected to a denaturing step, preferably comprising exposing the unhydrolyzed cellulose to elevated temperatures, thereby producing a **heat-treated** stream comprising the unhydrolyzed cellulose. The **heat-treated** stream comprising unhydrolyzed cellulose is then further hydrolyzed with cellulase enzymes to hydrolyze the cellulose to glucose.

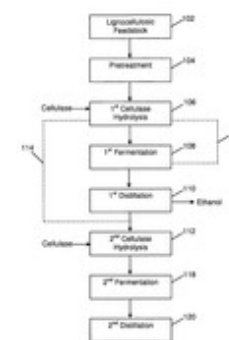


Figure 1

A fuel made from co-products derived from a **lignocellulosic biomass** fermentation process is used to fuel a cement production process. Filter cake and syrup co-products are mixed and dried, then burned in a cement kiln to create the temperatures needed for cement production.

Spezyme®

58.

Process for **treatment** of a **lignocellulosic** material

EP2655645

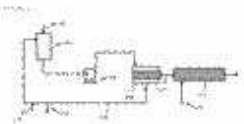
2013-10-30

SHELL

SHELL INTERNATIONALE RESEARCH

97 %

A process for **treatment** of a **lignocellulosic** material comprising contacting the **lignocellulosic** material with a solution of chloride ions, which solution comprises a concentration of chloride ions in the range from equal to or more than 1 ppm weight to equal to or less than 350 ppm weight based on the total weight of the solution; at a temperature in the range from equal to or more than 120°C to equal to or less than 200°C; and at a pH in the range from equal to or more than 0.1 to equal to or less than 4.



59.

Cellulignin fuel

EP1190020

2002-03-27

RM MATERIAIS REFRATARIOS

ALVARO GUEDES SOARES

CHRISTIAN ALEXANDRE VIEIRA

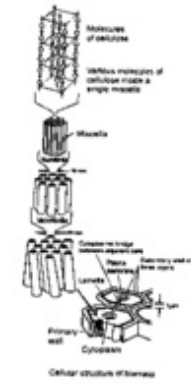
DALTRO GARCIA PINATTI

RM MATERIAIS REFRATATIOS

2 more...

97 %

The present invention relates to a catalytic cellulignin fuel obtained by a **biomass** pre-hydrolysis process and that is composed of cellulose and globulized **lignin** with a specific surface of about 1.5 - 2.5 m2/g. The cellulignin fuel according to the invention may be ground down to particles smaller than 250 mu m and has a combustion **heat** value that can reach up to 18 - 20 MJ/kg and an ignition time equal to or shorter than 20 ms (0.02s).



60.

Lignocellulosic **biomass** conversion

EP2904071

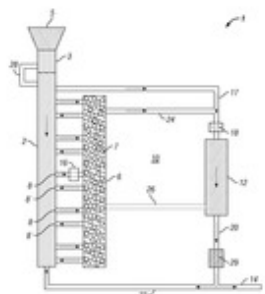
2015-08-12

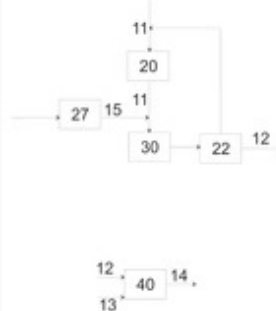
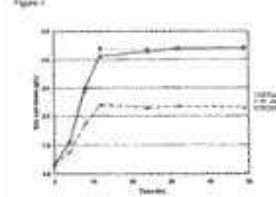
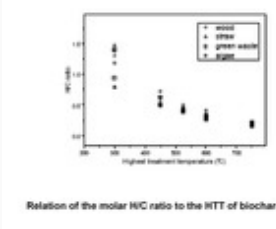
SHELL

SHELL INTERNATIONALE RESEARCH

97 %

Embodiments of the invention provide for a process, system, and composition for **lignocellulosic biomass** conversion that includes a supported metal catalyst having a avoid fraction in the range of from 45 % to 95 % and a surface area in the range of 10 m2/g to 1000 m2/g containing (a) Mo or W, and (b) Co, Ni or any mixture thereof.



61.	Lignin and method and system for processing lignin	EP2831088	2015-02-04	UPM KYMMENE	97 %	
62.	Treatment of biomass to obtain a target chemical	EP1869194	2007-12-26	SUSTAINABLE TECHNOLOGY ALLIANCE FOR SUSTAINABLE ENERGY DU PONT DE NEMOURS	97 %	
63.	Process for pyrolysis of lignin-rich biomass , carbon-rich solid obtained and use thereof as soil amendment or adsorbent	EP2457978	2012-05-30	EVONIK DEGUSSA	97 %	

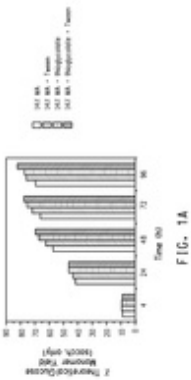
The invention relates to a method for processing **lignin**. The method comprises: feeding **lignin** material (11) to the system, decreasing particle size of the **lignin** material (11) in a grinding device (30) in order to manufacture **lignin** powder having particle size distribution wherein at least 85 wt.% of the **lignin** agglomerates and particles are less than 300 microns, and increasing dry solids content of the **lignin** material at least 5 percentage units while decreasing the particle size in the grinding device (30). In addition, the invention relates to a system for processing **lignin**, a **lignin** powder, a method for manufacturing a product comprising **lignin**, a system for manufacturing a product comprising **lignin** and a product comprising **lignin** powder.

Target chemicals were produced using biocatalysts that are able to ferment sugars derived from **treated biomass**. Sugars were obtained by pretreating **biomass** under conditions of high solids and low ammonia concentration, followed by saccharification.

The invention relates to a method for utilizing **biomass**, in which the **biomass** is pyrolysed within a temperature range from 550°C to 750°C to obtain driven-out gas and remaining carbon-rich solids. It is an object of the invention to specify a method for utilizing **biomass**, which is based on comparatively expensive feedstocks, but in return gives products of value with unusually good properties, the proceeds of which make the process economically viable. This object is achieved firstly by the use of **biomass** which has a **lignin** content of 10 to 30% by weight and a water content of 5 to 25% by weight, and by virtue of the residence time of the **biomass** within the temperature range from 550 to 750°C being ten to sixty minutes.

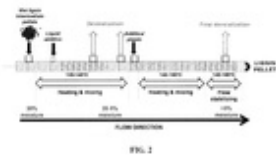
64.	Organic solvent pretreatment of biomass to enhance enzymatic saccharification	EP2358885	2011-08-24	SUSTAINABLE TECHNOLOGY DU PONT DE NEMOURS	97 %
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Biomass is pretreated using an organic solvent solution under alkaline conditions in the presence of one or more alkylamine and optionally one or more additional nucleophile to fragment and extract **lignin**. Pretreated **biomass** is further hydrolyzed with a saccharification enzyme consortium. Fermentable sugars released by saccharification may be utilized for the production of target chemicals by fermentation.



65.	Method for low water hydrolysis or pretreatment of polysaccharides in a lignocellulosic feedstock	EP2329047	2011-06-08	IOGEN ENERGY	97 %
A method is provided for hydrolyzing polysaccharides in a lignocellulosic feedstock to produce monosaccharides or pretreating a lignocellulosic feedstock, in which an aqueous slurry of the lignocellulosic feedstock is fed into a pressurized dewatering zone wherein the feedstock is partially dewatered and then is compressed into a plug. The plug is introduced into a reaction zone that operates at a pressure (Pr) equal to greater than about 90 psia and under suitable temperature and pH conditions to hydrolyze the polysaccharides or pretreat the feedstock. The plug provides a pressure seal between the outlet of the dewatering zone and the reaction zone. The pressure (Pdwi) of the aqueous slurry of the lignocellulosic feedstock at the inlet of the dewatering device is related to Pr as follows: $0 \leq P_r - 20 \text{ psia}$ and 220 psia, and where ΔP is the absolute difference in pressure between Pr and Pdwi in psia.					
66.	Lignin pellets and process for producing same	EP3504276	2019-07-03	DOMTAR PAPER NATIONAL RESEARCH COUNCIL OF CANADA	97 %

Lignin pellets comprising fused **lignin** are described herein. The **lignin** pellets may further comprise a processing aid, and/or a surfactant, and/or a chemical modifying agent, and/or a compatibilizer and/or a **thermoplastic** polymer. An extrusion process for producing the **lignin** pellets and their use in the manufacture of **lignin thermoplastic** blend products, polyols, polyphenols, polyaromatics and polyurethanes is also disclosed herein. The extruded **lignin** pellet may be dry-blended with additional **thermoplastic** and/or additive and then directly processed using processes such as injection molding, compression molding, extrusion, extrusion coating, blowing, **thermoforming**, stamping, foaming, fiber drawing, calendering or rolling.



67.

Continuous process for the production of ethanol from lignocellulosic biomass

WO2012/061939

2012-05-18

GREENFIELD SPECIALTY ALCOHOLS
GREENFIELD ETHANOL

97 %

A continuous process for the recovery of ethanol from hemicellulose and cellulose from lignocellulosic biomass. Yield of fermentable sugars can be maximized by continuous operation of the pre-treatment system and careful selection of pretreatment conditions including the addition of only small amounts of dilute mineral acid and low pressure. With this approach, the xylose component that is mainly present in its unfermentable oligomeric form in known pre-hydrolysis Kraft processes can be recovered more efficiently and as a monomer that can be fermented by xylose fermenting yeasts and bacteria. Due to the use of only dilute acids, there is a very low loss of glucose and xylose hence very low production of toxic chemicals (e.g. HMF, furfural) in the pretreatment step. The resulting overall fermentation efficiency of both hexose and pentose sugars is 90 % of the theoretical maximum.

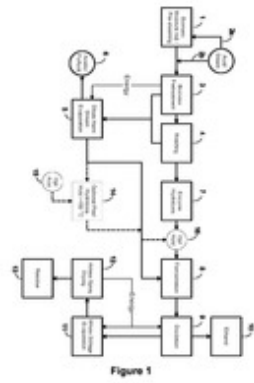


Figure 1

68.

Processing biomass

EP3461899

2019-04-03

XYLECO

97 %

The present application relates to a fermentation method comprising mixing in a medium xylose, one or more fermenting microorganisms, and an ionizing radiation irradiated cellulosic or lignocellulosic material, fermenting the xylose to a fermentation product, wherein the fermentation step produces fermentation product at a faster rate than would be produced in the fermentation step in the absence of the irradiated cellulosic or lignocellulosic material.

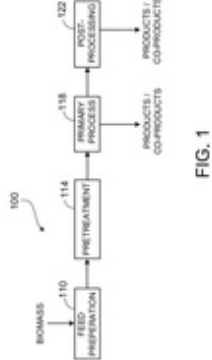


FIG. 1

69.

Processing biomass

EP2576213

2013-04-10

XYLECO

96 %

Biomass (e.g., plant biomass, animal biomass, and municipal waste biomass) is processed to produce useful intermediates and products, such as energy, fuels, foods or materials. For example, systems are described that can use feedstock materials, such as cellulosic and/or lignocellulosic materials, to produce an intermediate or product, e.g., by fermentation.

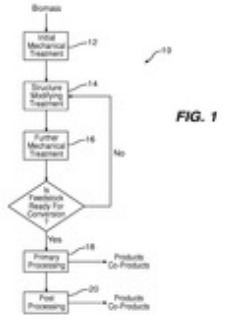


FIG. 1

70.

Device and thermodynamic method for producing mechanical energy

WO2009/125103

2009-10-15

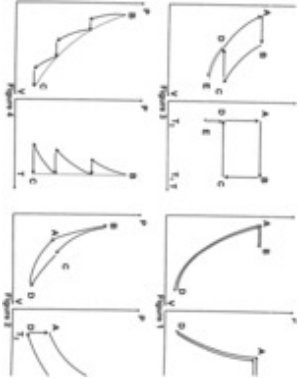
BERNARD PATRICE

BERNARD PATRICE PIERRE CHRISTIAN

BERNARD-ORHAN CLAUDIE

96 %

The device and method of the invention employ the mixing of a thermodynamic fluid with other, incompressible fluids having a high volumetric heat capacity, at certain steps of a thermodynamic cycle. In these steps of the thermodynamic cycle, the incompressible fluid accompanies the thermodynamic fluid in transformations in which it generates or receives work under quasi-isothermal conditions, and/or the incompressible fluid exchanges heat with the thermodynamic fluid in transformations in which it neither generates nor receives work with respect to the outside, and/or the two fluids are present in the same zone where the heat at high temperature is generated, called primary heat, for example from reactions with the oxygen contained in the thermodynamic fluid, and in which the presence of the incompressible fluid makes it possible to control the reactions and the temperature therein. These arrangements are by nature conducive to the reversibility of the thermodynamic transformations, allow thermodynamic cycles having a high efficiency and allow various types of reactants to be used in a flexible manner, such as solids, generating the primary heat mainly in internal combustion cycles or with more general chemical reactions than combustion. The qualitative and quantitative conditions of the mixing between a thermodynamic fluid and an incompressible fluid according to the present invention are defined therein. The expansion or compression apparatus is especially volumetric or dynamic apparatus, modified and adapted according to the invention when a thermodynamic fluid and an incompressible fluid are present as a mixture therein. The device may implement various thermodynamic cycles, for example an Ericsson cycle or a Brayton cycle. The device applies to the fields of the generation and use of mechanical energy, especially the propulsion of vehicles or the conversion of mechanical energy.



71.

Method for processing lignin during hydrothermal digestion of cellulosic biomass solids while producing a monohydric alcohol feed

EP2914691

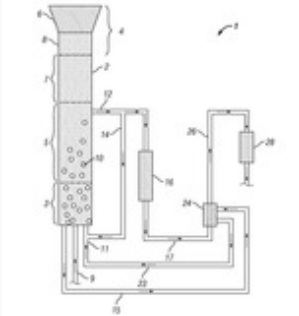
2015-09-09

SHELL

SHELL INTERNATIONALE RESEARCH

96 %

Digestion of cellulosic biomass solids may be complicated by release of lignin therefrom. Methods for digesting cellulosic biomass solids may comprise: providing cellulosic biomass solids in the presence of a digestion solvent, molecular hydrogen, and a slurry catalyst capable of activating molecular hydrogen; at least partially converting the cellulosic biomass solids into a phenolics liquid phase comprising lignin, an aqueous phase comprising a glycol derived from the cellulosic biomass solids, and an optional light organics phase; wherein at least a portion of the slurry catalyst accumulates in the phenolics liquid phase as it forms; combining the glycol with the phenolics liquid phase, thereby forming a combined phase; and heating the combined phase in the presence of molecular hydrogen; wherein heating the combined phase reduces the viscosity of the phenolics liquid phase and transforms at least a portion of the glycol into a monohydric alcohol.



72.

Materially and energetically optimized bioethanol production process

EP2240592

2010-10-20

DESMET BALLESTRA ETHANOL

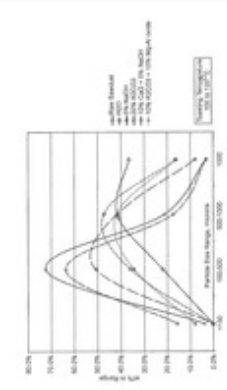
96 %

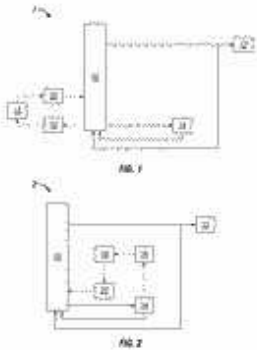
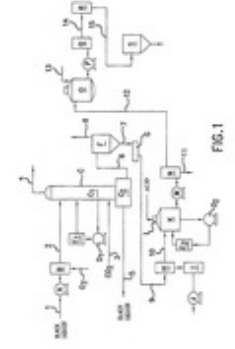
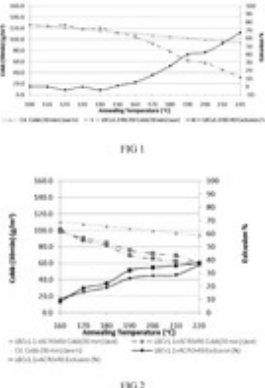
The invention relates to an improved relatively economical process and a corresponding device for producing bioethanol from cereal and lignocellulose-containing biomasses in which a production line for cereal and a production line, operated simultaneously, for lignocellulose are operated as far as the saccharification stage and a specific fermentation, depending on the biomass used, and then the material streams are fed to a combined distillation and dewatering stage.



73.	Process for converting solid biomass material	EP2352877	2011-08-10	INAERIS TECHNOLOGIES KAJOR INK KIOR	96 %
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A method is disclosed for reducing the mechanical strength of solid biomass material, in particular ligno-cellulosic biomass. The method comprises heating the solid biomass material to a temperature in the range of 105 °C to 200 °C. The heat treatment, which is referred to as "toasting", significantly reduces the mechanical energy required for reducing the particle size of the solid biomass material. The method is particularly suitable as a pretreatment step to a conversion reaction of the solid biomass material.



76.	Methods and systems for processing lignin through viscosity reduction during hydrothermal digestion of cellulosic biomass solids	EP2914693	2015-09-09	SHELL INTERNATIONALE RESEARCH SHELL	96 %	
Digestion of cellulosic biomass solids may be complicated by lignin release therefrom, which can produce a highly viscous phenolics liquid phase comprising lignin polymer. Systems for processing a phenolics liquid phase comprising lignin polymer may comprise: a hydrothermal digestion unit; a viscosity measurement device within the hydrothermal digestion unit or in flow communication with the hydrothermal digestion unit; a temperature control device within the hydrothermal digestion unit or in flow communication with the hydrothermal digestion unit; and a processing device communicatively coupled to the viscosity measurement device and the temperature control device, the processing device being configured to actuate the temperature control device if the viscosity of a fluid phase comprising lignin exceeds a threshold value in the biomass conversion system.						
77.	Process for treating lignin	EP3494256	2019-06-12	LIQUID LIGNIN	96 %	
A process for recovery of lignin from black liquor that contains either soluble or dispersed lignin by generating a "liquid lignin" at high yield is disclosed. Soluble lignin at a high pH is precipitated by reducing the pH of the black liquor stream by countercurrent reaction with carbon dioxide, at elevated temperature and pressure, creating a heavy lignin-rich phase and a light lignin-depleted phase. The heavy lignin-rich phase is separated and washed countercurrently with a non-sulfur containing acid, such as acetic acid, to displace metal cations from the lignin, creating a low-salt lignin, which is then formed into a low-dust, high-bulk density lignin fuel pellet. If desired, an oxidation step may be used to eliminate odor for lignins having high value green chemistry applications.						
78.	Lignin-based waterproof coating	EP3058040	2016-08-24	UNIVERSITY OF QUEENSLAND KUIINZURANDO UNIVERSITY OF TECHNOLOGY	96 %	
A method of forming a coating on a substrate is provided comprising forming a lignin solution by at least partially dissolving lignin in a solvent, coating the lignin solution onto the substrate and exposing the lignin coated substrate to a treatment selected from the group consisting of a heat treatment and an acid treatment. The coating provides for improved waterproofing and/or strengthening of the substrate.						

79.

Processing biomass

EP3480217

2019-05-08

XYLECO

96 %

Biomass (e.g., plant **biomass**, animal **biomass**, microbial, and municipal waste **biomass**) is processed to produce useful products, such as food products and amino acids.

80.

Carbon fibre compositions comprising lignin derivatives

EP2536780

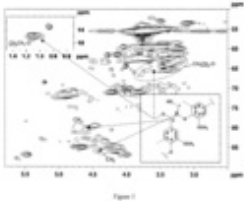
2012-12-26

FIBRIA INNOVATIONS

95 %

FIBRIA INNOVATIONS
FIBRIA INNOVATIONS
GOLDFISH CANADA
LIGNOL INNOVATIONS
SUZANO CANADA

The present disclosure provides derivatives of native **lignin** having a certain carbon content and/or a certain alkoxy content and their use in carbon fibres.



81.

Biomass, thermal pressure hydrolysis and anaerobic digestion

EP3394339

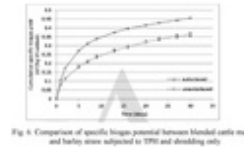
2018-10-31

THERMO PRESSURE TECHNOLOGY

95 %

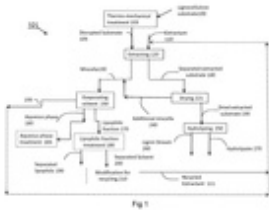
THERMO PRESSURE TECHNOLOGY
AEROTHERMAL GREEN ENERGY
CELTIC BIOENERGY
LUCAS BRIAN RONALD

A process is provided for preparing a low density, fibrous primary **lignocellulose biomass**, particularly straw for anaerobic digestion at large scale, i.e. >2 MWth, which comprises a step that greatly increasing the density of the straw through size reduction, moisture adjustment and compression ahead of loading and subsequent agitation of the resultant **biomass** in a pressure vessel through an atmosphere of saturated steam providing **heat for thermal-pressure hydrolysis** and recovering **treated biomass** from the vessel. The primary **lignocellulose biomass** may be prepared in admixture with secondary **biomass** which may be manure-based. There is also provided a feedstock for anaerobic digestion comprising a fibrous primary **lignocellulose biomass** in a finely divided state, a secondary **biomass** providing anaerobically digestible nitrogen and aqueous liquid, the primary **biomass** having a disrupted cellular structure such that its inherent buoyancy in aqueous liquid is lost and digestible carbon is released and the mixture being in the form of an aqueous slurry in a sterilized state. The feedstock after **thermal pressure hydrolysis** may be anaerobically digested e.g. by wet mesophilic anaerobic digestion to achieve a high unit throughput and biomethane output thus allowing the deployment of the system at large scale within the anaerobic digestion industry.



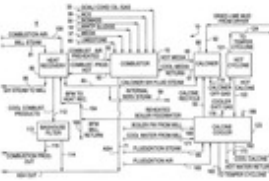
82.	Methods and systems for processing lignocellulosic materials and related compositions	WO2012/079021	2012-06-14	HCL CLEANTECH	95 %
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A method comprising: (a) providing a lignocellulosic substrate; (b) contacting said lignocellulosic substrate with an extractant comprising a water-soluble organic solvent to form an extracted substrate and a miscella; (c) removing miscella from said extracted substrate; and (d) hydrolyzing said extracted substrate using a chemically catalyzed process.



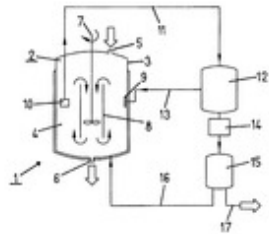
83.	Process and system for producing commercial quality carbon dioxide from high solids lime mud	EP2071926	2009-06-24	ROSSI, ROBERT A.	95 %
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The invention features methods and systems for producing commercial quality carbon dioxide (CO2) of 90% to +99% purity using, wet calcium carbonate lime mud produced in a manufacturing operation, for instance, Kraft pulp mill lime mud (a.k.a., "lime mud") as a feedstock to a multi-stage lime mud calcination process. This process may be fueled with waste water treatment plant (WWTP), sludge biomass, precipitated lignins, coal, or other low cost solid fuels. High reactivity "soft-burned" lime product ("calcine") required in the mill's chemical recovery circuit is also produced, and steam and heated boiler feed-water is generated and exported to the mill's steam distribution and generation system as well as hot process water for use in the mill's boiler house and manufacturing operation. The system for calcining calcium carbonate lime mud produced from a re-causticizing manufacturing operation and converting it to re-burned lime and CO2 comprises a calciner and a combustor linked by a moving media heat transfer (MMHT) system or apparatus. The MMHT system or apparatus thermally links separate fluid bed combustion (exothermic) and calcination (endothermic) stages with a solid particulate media. The system further comprises a flash dryer or spray dryer that utilizes exhausted heat from the calcination stage.



84.	Material and/or fuel produced from biomass	EP2106435	2009-10-07	ANTACOR ANTACALL MARTIN SCHWEIGER SCHWEIGER MARTIN	95 %
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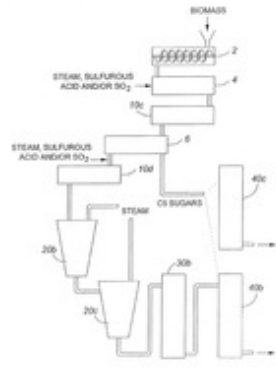
The invention relates to a material and/or fuel that is produced from biomass. Said material and/or fuel can be produced according to a method, wherein the biomass is treated at a temperature of above 100 degrees Celsius and a pressure of above 5 bar for a duration of treatment of at least one hour.



86.	Liquefaction of biomass at low ph	EP2776591	2014-09-17	RENMATIX REAC FUEL RENMATIKS INK SRIYA INNOVATIONS	95 %
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Figure 2

87.	Systems and methods for an integrated solar driven chemical plant	WO2010/144537	2010-12-16	SUNDROP IP HOLDINGS SUNDROP FUELS	95 %	
(WO2010/144540) A method, apparatus, and system for an integrated solar- driven chemical plant that manages variations in solar energy are disclosed. In some embodiments, a chemical reactant, including particles of biomass, are converted in a solar driven chemical reactor into synthesis gas containing carbon monoxide and hydrogen using concentrated solar energy to drive the conversion of the chemical reactant. The synthesis gas is supplied for a catalytic conversion of the synthesis gas in a methanol synthesis plant to methanol. Cycling occurs between an operational state and an idle state for a number of methanol trains in the methanol synthesis plant depending upon an amount of synthesis gas generated in the solar driven chemical reactor. A control system for the chemical reactor sends control signals to and receives feedback from a control system for the methanol synthesis plant.						
88.	Method and device for producing resin raw material from lignocellulosic biomass	JP2013163796	2013-08-22	NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE & TECHNOLOGY	95 %	
PROBLEM TO BE SOLVED: To provide a method and device for highly efficiently producing a resin raw material comprising a lignin derivative as a main component from a lignocellulosic biomass by subcritical water treatment. SOLUTION: A method for producing a resin raw material includes: pulverizing a lignocellulosic biomass; mixing the biomass with water to make a water slurry; treating the slurry at a prescribed temperature under a saturated vapor pressure or higher for over 30 min; performing a solid-liquid separation at the prescribed temperature after reaction treatment to separate a solid polymeric lignin component; separately taking out the hemicellulose hydrolysate of a high-temperature hot water-soluble component, cellulose hydrolysate and a low-molecular weight lignin derivative being the resin raw material; separating the hemicellulose hydrolysate and the cellulose hydrolysate at 100°C or below in a state of the low-temperature hot water-soluble component; and separating the low-temperature lignin derivative being the resin raw material in a grease form. A device therefor is also provided. The invention enables high-efficiency production process of the resin raw material avoiding clogging in the outlet line of a reactor. COPYRIGHT: (C)2013,JPO&INPIT						
89.	Sulfur dioxide and/or sulfurous acid pretreatment	WO2017/100907	2017-06-22	IOGEN	95 %	
A process for producing alcohol from lignocellulosic biomass includes adding at least one of sulfur dioxide and sulfurous acid to the lignocellulosic biomass to provide an effective sulfur dioxide dosage and/or effective sulfur dioxide slurry concentration, each of which is calculated using the ratio of the volume of the slurry in the pretreatment reactor to the total volume of the pretreatment reactor, within a predetermined range.						

90.

Process for hydrolyzing a pretreated feedstock and recovering lignin

WO2015/081439

2015-06-11

IOGEN

95 %

The present invention relates to a process for hydrolyzing a pretreated **lignocellulosic** feedstock. The process comprises hydrolyzing the pretreated **lignocellulosic** feedstock with an enzyme mixture comprising at least cellulase enzymes to produce a hydrolyzed slurry comprising glucose and **lignin** solids. The hydrolyzing is conducted in the presence of a polymer, such as for example an aliphatic polyether. A solids-liquid separation is conducted to recover **lignin** solids from a process stream comprising the **lignin** solids and the polymer. A process stream is then obtained comprising recovered **lignin** solids resulting from the solids-liquid separation. Also provided are processes for recovering the polymer from the **lignin** solids and/or from solution.

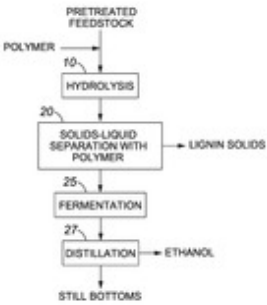


FIG. 1A

91.

Method for manufacturing furfural from lignocellulose-containing biomass

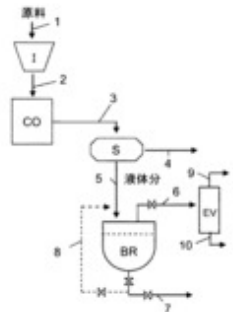
JP2014043411

2014-03-13

OJI HOLDINGS

95 %

PROBLEM TO BE SOLVED: To provide a method for efficiently producing furfural from a chemically **treated lignocellulose** ingredient.
SOLUTION: After a **lignocellulose** ingredient has been chemically **treated**, the obtained chemically **treated** ingredient (ingredient suspension) is separated into solid and liquid components by a solid-liquid separator, and after the liquid component separated by the solid-liquid separator has been fed into and **heated** within a **heating** apparatus, a furfural-containing vapor phase is separated and retrieved from the **heated** liquid, whereas the vapor phase is further fed into and **treated** within a distillation apparatus so as to recover a furfural-containing concentrate liquid.
COPYRIGHT: (C)2014,JPO&INPIT



92.

Processing biomass

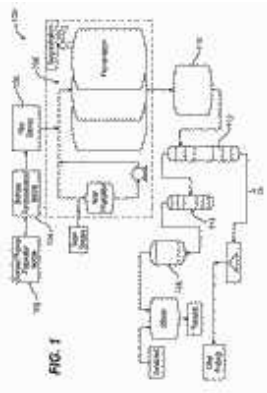
EP2432888

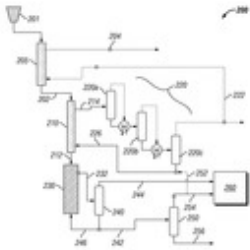
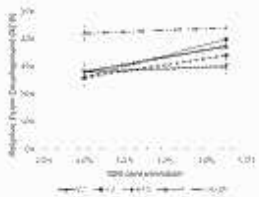
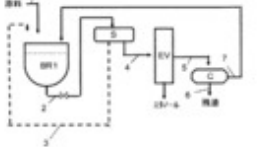
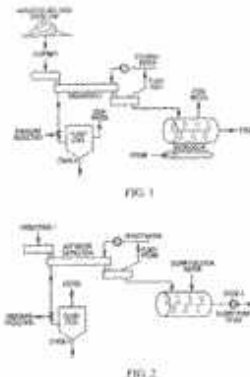
2012-03-28

XYLECO

95 %

Biomass (e.g., plant **biomass**, animal **biomass**, and municipal waste **biomass**) is processed for use in the production of useful products, such as fuels. For example, systems can use **biomass** materials, such as cellulosic and/or **lignocellulosic** materials, to enhance the production of a product, e.g., the production of ethanol and/or butanol by fermentation.



96.	Biomass pretreatment for hydrothermal hydrocatalytic conversion	WO2015/095447	2015-06-25	SHELL SHELL INTERNATIONALE RESEARCH	94 %	
A method for thermo-catalytically producing C4+ hydrocarbons from lignocellulosic biomass solids is provided by reducing the water content of the biomass feed prior to biomass hydrothermal hydrocatalytic conversion.						
97.	Bitumen compositions comprising lignin	EP3380555	2018-10-03	INBICON	94 %	
The current invention concerns composition comprising bitumen, one or more plasticity modifying agent(s), and lignin , as well as methods and uses related to such compositions. In particular, compositions are disclosed with improved properties, such as mixing properties.						
98.	Method of producing ethanol from biomass containing lignocellulose	JP2014054208	2014-03-27	OJI HOLDINGS OJI HOLDINGS	94 %	
PROBLEM TO BE SOLVED: To provide a method of producing ethanol from biomass containing lignocellulose in which a residue (undecomposed fibers) separated in a production process is re-used as a raw material for saccharification. SOLUTION: A lignocellulose-based raw material is processed in a concurrent saccharifying fermentation process, a processed suspension discharged from the concurrent saccharifying fermentation process is separated into a solid content and a liquid fraction by a solid-liquid separator of 1.25 to 600 mesh, and the liquid fraction separated in the solid-liquid separation process is separated into a fermentation product and a concentrated liquid from which the fermentation product has been removed, by reduced-pressure distillation. The concentrated liquid from which the fermentation product has been removed, which has been separated in the distillation process, is separated into a liquid fraction and a residue by a residue separator, chemical is added to the residue separated in the residue separation process, and the residue is heated. The chemically treated residue is re-used as a raw material for the concurrent saccharifying fermentation. COPYRIGHT: (C)2014,JPO&INPIT						
99.	Lignin and other products isolated from plant material, and methods and compositions therefor	EP2193138	2010-06-09	VERTICHEM BIOJOULE	94 %	
Lignin polymers having distinctive properties, including a generally high molecular weight and generally homogeneous size distribution, as well as preservation of native reactive side groups, are isolated by solvent extraction of plant materials. Methods for isolation of lignin polymers, and for use of the isolated lignin polymers are disclosed. Compositions containing lignin isolated from plant materials, such as carbon fiber composites, resins, adhesive binders and coatings, polyurethane-based foams, rubbers and elastomers, plastics, films, paints, nutritional supplements, food and beverage additives are disclosed. Xylose and xylose derivatives, furfural, fermentable sugars, cellulose and hemi-cellulose products may be used directly or further processed. The lignin polymers and other plant-derived products disclosed herein may be produced in abundance at low cost, and may be used as substitutes for feedstocks originating from fossil fuel or petrochemical sources in the manufacture of various products.						

100. Processing biomass to obtain hydroxylcarboxylic acids

EP2890794

2015-07-08

XYLECO
SILICO

94 %

Biomass (e.g., plant biomass, animal biomass, and municipal waste biomass) is processed to produce useful intermediates and products, such as hydroxy-carboxylic acids and hydroxy-carboxylic acid derivatives. A method includes treating a reduced recalcitrance lignocellulosic or cellulosic material with one or more enzymes and/or organisms (such as lactobacillus, Pediococcus, Rhizopus, Enterococcus) to produce an alpha, beta, gamma and/or delta hydroxycarboxylic acid (such as lactic acid, glycolic acid); and converting the alpha, beta, gamma and/or delta hydroxy-carboxylic acid to the product (such as esters, polymers, and copolymers).

