This month's selection in brief

This month's **Patent Alert** spotlights cutting-edge innovations from companies leading the way in **chemical textile recycling**. We highlight **fiber-to-fiber technologies (TRL > 7)** that clearly illustrate the industry's accelerating shift toward **true circularity**.

These newly filed patents show how a strong intellectual-property strategy can be a decisive success factor—helping innovators secure their position and scale impact within a rapidly evolving field.

At Centexbel, we are committed to advancing technologies that push the textile sector toward greater **circularity, sustainability, and environmental responsibility**. Supporting innovators on this journey lies at the core of our mission.

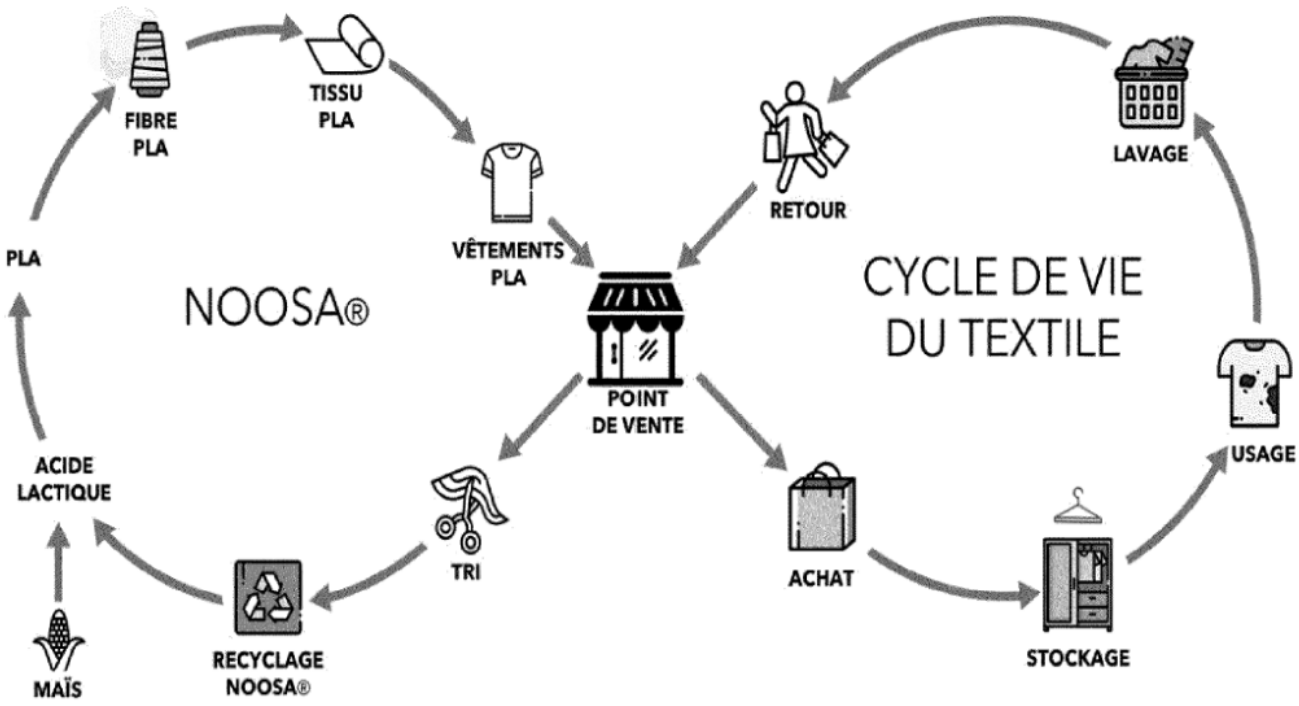
Discover our research on textile recycling: https://www.centexbel.be/en/innovation/research

Selected Patents:

Method for recycling textiles containing polylactic acid

Patent number: WO2021148549
Publication date: 2021-07-29
Applicant(s): NOOSA [BE]
Inventor(s): VAN GANSBERGHE FRÉDÉRIC [BE]; GOMEZ URGOITI MARIA [BE]

The invention relates to a method for chemically recycling all types of textiles containing polylactic acid (PLA) and in particular garments. After the life cycle of the garment, it is collected and recycled. The recycling method consists of mechanically treating, decontaminating and hydrolysing the textile to revert to the initial monomer, lactic acid. The latter can then be reused and converted back into a virgin PLA polymer, so that it can be made into textile fibre again.



Process for degrading a plastic product comprising at least one polyester

Patent number: WO2022243545
Publication date: 2022-11-24
Applicant(s): CARBIOS [FR]
Inventor(s): MARTY ALAIN [FR]; BORSENBERGER VINCIANE [FR]; TOURNIER VINCENT [FR]

The present invention relates to a process for degrading plastic products that comprises a step of enzymatic depolymerization implemented in acidic conditions at a pH between 4 and 6, in a reaction medium containing a defined amount of soluble equivalent terephthalic acid mostly in the form of salts.

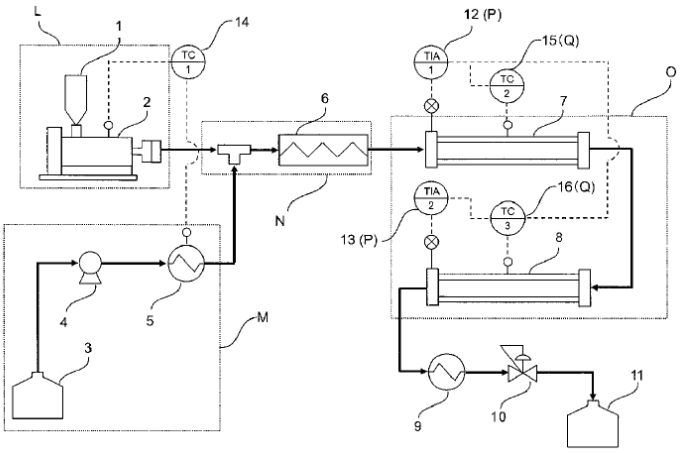
	Switch equivalent TA concentration in the liquid phase (g/kg)	Switch NaOH addition in the reaction medium (g/kg)	Switch depolymerization rate (%)	Total depolymerization rate at T=140 h (%)	pH during the main acidic depolymerization step	Base consumption saving (%)
Ref-1	38	16	21 %	39 %	5.26	47%
Ref-2	33	12	21 %	35 %	5.27	44 %
Ref-3	36	13	21 %	35 %	5.35	43 %
Ref-4	58	24	33 %	62 %	5.42	47 %
Ref-5	90	38	56 %	92 %	5.42	39 %
Control 1 (regulation pH 8)	-	-	-	95 %	8	0
Control 2 (regulation pH 5.2)	-	-	-	38 %	5.2	25 %

Table 1: Parameters and results of processes of the invention

Recycled monomer, recycled monomer production method, and recycled monomer production device

Patent number: WO2024004774
Publication date: 2024-01-04
Applicant(s): TORAY INDUSTRIES [JP]
Inventor(s): NISHIMURA MIHOKO [JP]; YAMASHITA KOHEI [JP]; NAGAHARA TAKASHI [JP]; YOSHIDOMI SHINICHIRO [JP]; YOSHIKAWA TAKAHIRO [JP]; KATO KOYA [JP]; UTAZAKI KENICHI [JP]

The purpose of a recycled monomer and a production method therefore according to the present invention is to provide a method that can, while utilizing the advantage of high-temperature high-pressure water, suppress hyperreaction of a product obtained through depolymerization and produce, at a high yield, a recycled monomer of a dicarboxylic acid, a diol, or the like. In order to achieve said purpose, in a preferable aspect of this recycled monomer production method, a polymer is a thermoplastic polyester (A), and when the melting point of the thermoplastic polyester (A) as measured using a differential scanning calorimeter is defined as Mp°C, the reaction temperature is defined as X°C, the reaction time is defined as Y minutes, and the mass ratio of water and the thermoplastic polyester (A) is defined as Z:1, X and a product X·Y·Z of X, Y, and Z simultaneously satisfy the following (I) and (II). (I): Mp ≤ X < 300 (II): 2000 ≤ X·Y·Z ≤ 20000

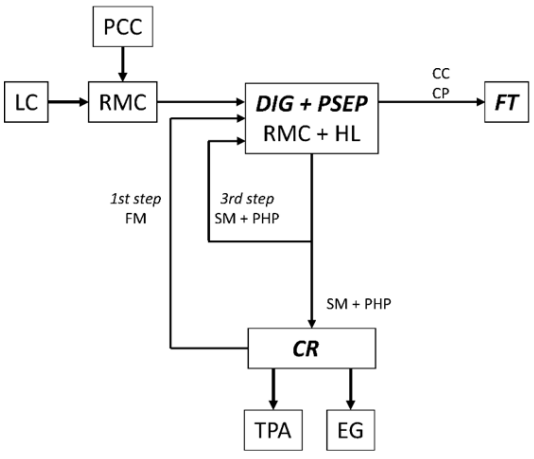


An apparatus of producing a recycled monomer, including: means (L) for heating, pressurizing, and supplying a composition containing a polymer; means (M) for generating and supplying subcritical water; means (N) for mixing the composition containing a thermoplastic polymer and supplied from the means (L) and the subcritical water supplied from the means (M); and a continuous reactor (O) for conducting hydrolysis of the polymer and a temperature control mechanism (Q) for heating and/or cooling the continuous reactor (O)

A process for separation of the cellulosic part from a polyester and cellulose composition

Patent number: WO2020013755
Publication date: 2020-01-16
Applicant(s): SOEDRA SKOGSAEGARNA EKONOMISK FOERENING [SE]
Inventor(s): BRELID HARALD [SE]; BOGREN JOHANNES [SE]

The present invention relates a process for separation of the cellulosic part from a raw material composition comprising polyester and cellulose containing composition, wherein the process comprises providing a blend, wherein the blend comprises a raw material composition and a hydrolyzing liquor, wherein the raw material composition comprises a polyester composition, wherein the polyester composition comprises 99%, or less,by weight of polyester and 1 %, or more, by weight of cellulose containing component or components, wherein the hydrolyzing liquor comprises a first mixture comprising an alkaline solution containing hydroxide ions, the hydrolyzing liquor is added to give the blend an effective alkali concentration in a range from 5g/l to 150 g/l, wherein the effective alkali concentration is calculated as NaOH, and the hydrolyzing liquor: raw material composition ratio is from 1.5:1 up to 25:1, i.e. from 5 dm3 /kgup to 25 dm3/kg, and keeping the blend at a temperature of 100 °C or above, e.g. 110 °C or above, for example, 115 °C or above, e.g. 120 °C or above, for example, 125 °C or above, e.g. 130 °C or above, for example, 135 °C or above, or, e.g. 140 °C or above; a cellulosic composition obtainable from the process for separation, a mixture comprising polyester hydrolysis products obtainable from the process for separation, a pulp, a dissolving pulp, a paper pulp, a regenerated cellulosic fibres product, and a paper product.



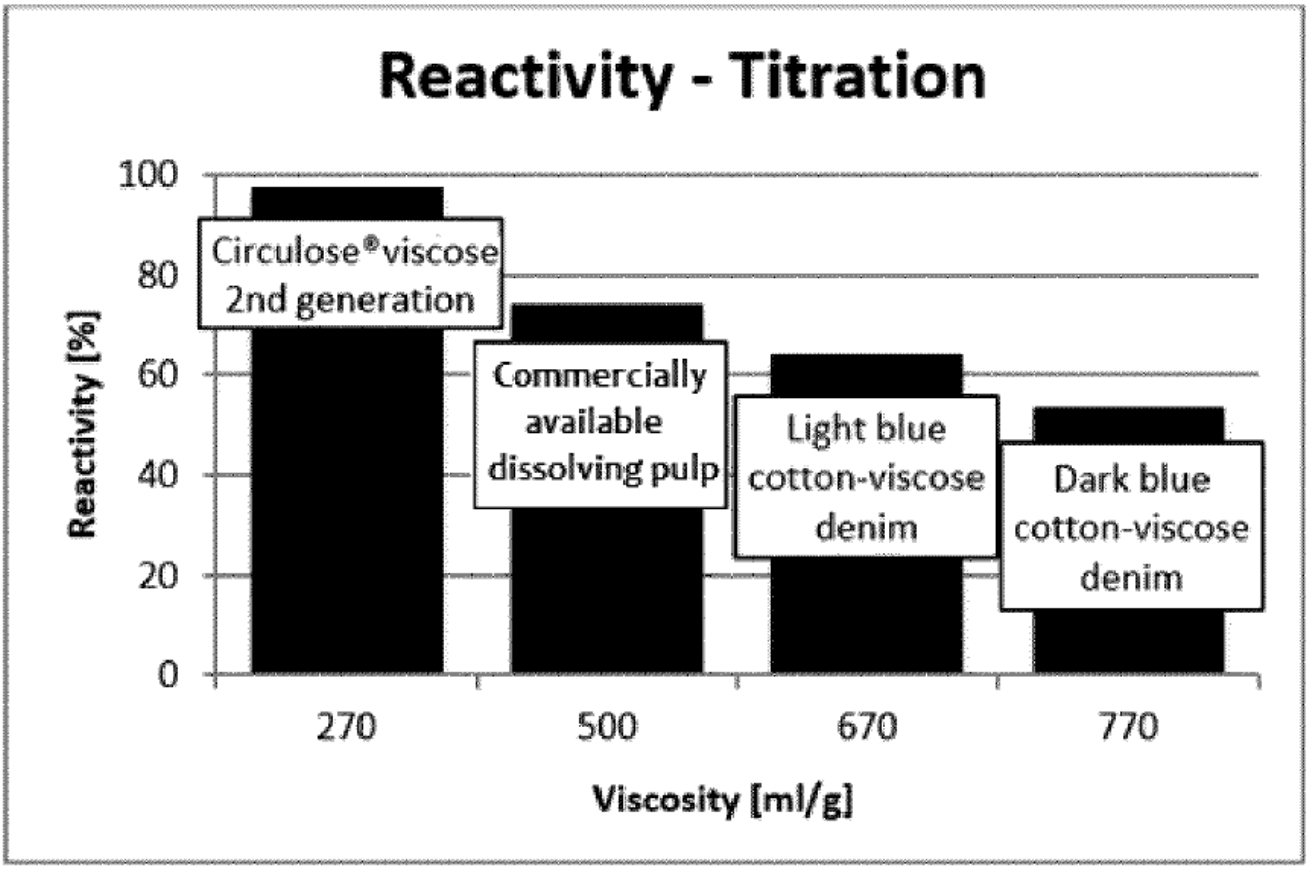
RMC : raw material composition
PCC: polycotton composition
LC: lignocellulosic composition
PSEP: physically separating step
HL: hydrolyzing liquor,
DIG: digester
CC: cellulosic composition
CP: cellulosic part
FT: further treatment
FM: first mixture (here industrial white liquor)
SM: second mixture (here industrial black liquor)
PHP: polyester hydrolysis products
CR: chemical recovery
TPA: terephthalic acid
EG: ethylene glycol

Schematic process for separation of the cellulosic part from a raw material composition

Recycling of mixtures of textiles comprising cellulose

Patent number: WO2023139168
Publication date: 2023-07-27
Applicant(s): CIRCULOSE AB [SE]
Inventor(s): KALDÉUS TAHANI [SE]; HENRIKSSON GUNNAR [SE]; LINDSTROM MIKAEL [SE]; WILSBY ASTRID [SE]

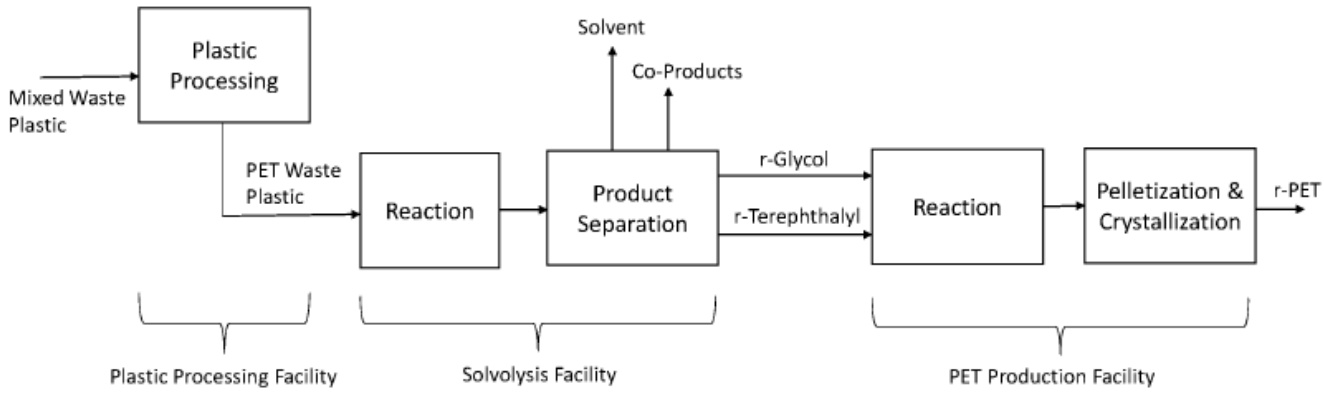
There is provided a method for recycling a mixture of textiles comprising natural cellulose fibers and man-made cellulose fibers. After a mechanical disintegration the material is swelled under reducing conditions and thereafter bleached with at least one oxidative bleach. The bleaching is adjusted so that the limiting viscosity number as determined by ISO 5351:2010 for the resulting material after step d) is reduced to a value in the interval 200-1200 ml/g, or not higher than the initial limiting viscosity number. The reactivity of the material is improved, in particular for repeated recycling of viscose fibers. This makes it easier to use the fibers in a subsequent viscose process where steps can be omitted or reduced.



Integrated chemical recycling facility with polyethylene terephthalate production

Patent number: WO2023137316
Publication date: ·2023-07-20
Applicant(s): EASTMAN CHEM CO [US]
Inventor(s): EKART MICHAEL [US]; DEBRUIN BRUCE [US]; BEECHER ALAN [US]; SCHELDEMAN DAAN [BE]

Processes and systems for producing recycled content polyethylene terephthalate (r-PET) are provided. Integration of chemical recycling facilities with PET production facilities reduces energy consumption and helps minimize adverse environmental impacts, while providing valuable end products having up to 100 percent recycled content.



Block flow diagram illustrating the main steps of an integrated chemical recycling facility, particularly illustrating the main steps of a plastic processing facility, a solvolysis facility, and a polyethylene terephthalate (PET) production facility

Separation of elastic fibers in textile materials

Patent number: WO2024074523
Publication date: 2024-04-11
Applicant(s): BASF SE [DE]
Inventor(s): WITZEL SINA [DE]; MANGOLD HANNAH STEPHANIE [DE]; THIEL INDRE [DE]; REIN CHRISTIAN [DE]; JUNG PHILIPP MAXIMILIAN [DE]; STAMMER ACHIM [DE]; MAY TOBIAS [DE]

The invention relates in a first aspect to a method for separating a polymer blend, wherein the polymer blend comprises (i) a polyamide and/or a cellulose based polymer, (ii) an elastic fiber; the method comprising: (a) providing the polymer blend and providing a solvent comprising gamma-valerolactone; (b) contacting the polymer blend with the solvent comprising gamma-valerolactone at a temperature T1 of < 170 °C, thereby obtaining a solvent, which is enriched in dissolved elastic fiber, and a residue of the polymer blend, which is depleted of said elastic fiber and comprises the polyamide and/or the cellulose based polymer. In a second aspect, the invention is related to a polyamide and/or cellulose based polymer obtained or obtainable from the method of the first aspect. A third aspect of the invention is related to the use of the cellulose based polymer of the second aspect and a fourth aspect of the invention is related to the use of the polyamide polymer of the second aspect.

Experimental results for PA/elastic fiber separation from beach fashion

		mass	NMR
		weighted with balance	PA content by quantitative ^{1}H-NMR [g/100g]
Before treatment	Black, pink, blue, yellow, white beach fashion (starting material)	10 g	83.0 ± 1.0
Process conditions	10 g/100 g = 1:10 (PA+Spandex:GVL) Procedure 1 4 h, 150 °C		
After treatment	polymeric material pieces after drying	8.3 g reobtained PA	95.7 ± 1.0

Experimental results for Cotton/elastic fiber separation

		mass
		weighted with balance
Before treatment	White top (starting material)	10 g
Process conditions	10 g/100 g = 1:10 (PA+elastic fiber:GVL) Procedure 1 4 h, 150 °C	
After treatment	polymeric material pieces after drying	8.2 g reobtained Cotton

Process for producing epsilon-caprolactam by depolymerization of polycaprolactam (pa6)

Patent number: WO2023084441
Publication date: 2023-05-19
Applicant(s): AQUAFIL S P A [IT]
Inventor(s): BERTOLLA MADDALENA [IT]; CECCHETTO MICHELE [IT]; DAL MORO ANACLETO [IT]; MODESTI MICHELE [IT]; GUERRA STEFANO [IT]

The present invention relates to a process for producing ε-caprolactam by depolymerization of polycaprolactam (PA6) which comprises : a. contacting a composite material comprising PA6 and at least one fibrous reinforcing material with a solvent comprising at least one polyol, at a temperature in the range 130°C 200°C, so as to obtain a solution comprising solubilized PA6 and an insoluble fraction comprising at least said fibrous reinforcing material; b. separating said insoluble fraction from said solution; c. combining said solution with a coagulation liquid comprising water to obtain a partially depolymerized coagulated PA6 dispersed in a liquid phase; d. separating said coagulated PA6 from said liquid phase; e. subjecting said coagulated PA6 separated in said phase d to further depolymerization by hydrolysis to obtain ε-caprolactam.

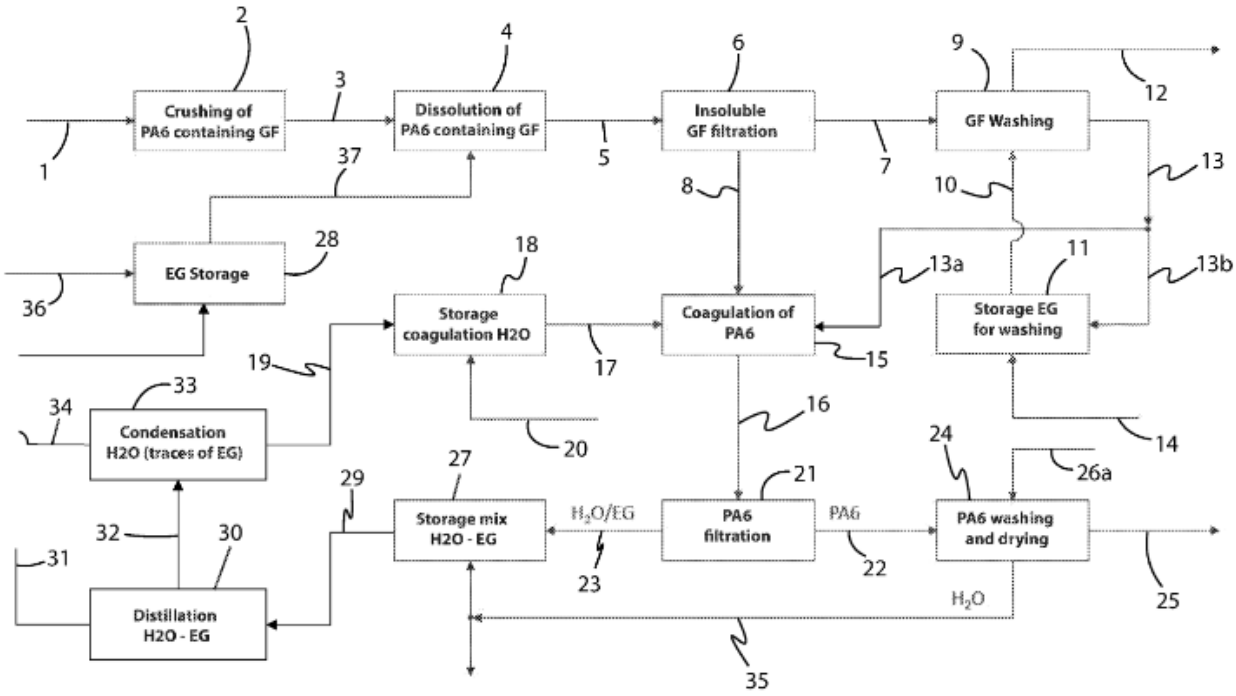


Fig. 1 Schematic representation of the process to produce E-caprolactam according to the present invention wherein: "PA6 with GF" means a composite material comprising polyamide and glass fibre as reinforcing material; "EG" is ethylene glycol.