

Polyester Textile Recycling

This month's selection in brief

Polyester is the most widely used synthetic textile fibre, with polyethylene terephthalate (PET) being one of its most common forms. PET is extensively employed in textile manufacturing, either as a pure material or blended with natural fibres like cotton. Due to its widespread application, implementing effective end-of-life strategies for PET and polyester textiles is crucial to reducing textile waste. Among these strategies, recycling plays a central role and is the focus of this month's patent alert. The selected patents primarily explore innovations in chemical recycling processes, while others present methods involving chemical treatments to remove impurities—such as dyes—prior to the mechanical recycling of recovered PET fibres.

Patents on PET Textile Recycling:

Catalysts for polyethylene terephthalate degradation _____	2
A method to recycle a stream of polyester waste material and a system for applying the method _____	3
Method for regeneration of polyester and recycling of polyester textile waste using a thermal treatment _____	4
Process for recovery of a polyethylene terephthalate-based polymer from a polymeric material _____	5
Systems for decoloring and recycling pure fibers _____	6
Method for room temperature depolymerization of terephthalic polyesters to terephthalate esters _____	7
A method of recycling at least a portion of a textile material comprising polyester fibers, and a system intended therefore _____	8
A method and system for recycling at least a portion of a textile material comprising polyester fibers _____	9

Entry	PET (g)	Catalyst (mol%)	Conversion (%)	Yield of BHET (%)
1 ^b (ref)	0.2 g	CO ₂ (15-30 mol% or 1 atm)	not detected	0%
2 (ref)	2 g	Zn(OAc) ₂ (25 mol%)	44%	40%
3 (ref)	2 g	ZnCl ₂ (25 mol%)	75%	52%
4 (ref)	2 g	DMAP (30 mol%)	63%	46%
5	2 g	DMAP/CO ₂ (30 mol%)	81%	69%
6	9 g	NH ₄ HCO ₃ (10 mol%)	65%	51%
7	9 g	NH ₄ HCO ₃ (25 mol%)	63%	52%
8 (ref)	2 g	NH ₄ OH (25 mol%)	27%	26%

A method to recycle a stream of polyester waste material and a system for applying the method

Patent number: WO2024177502

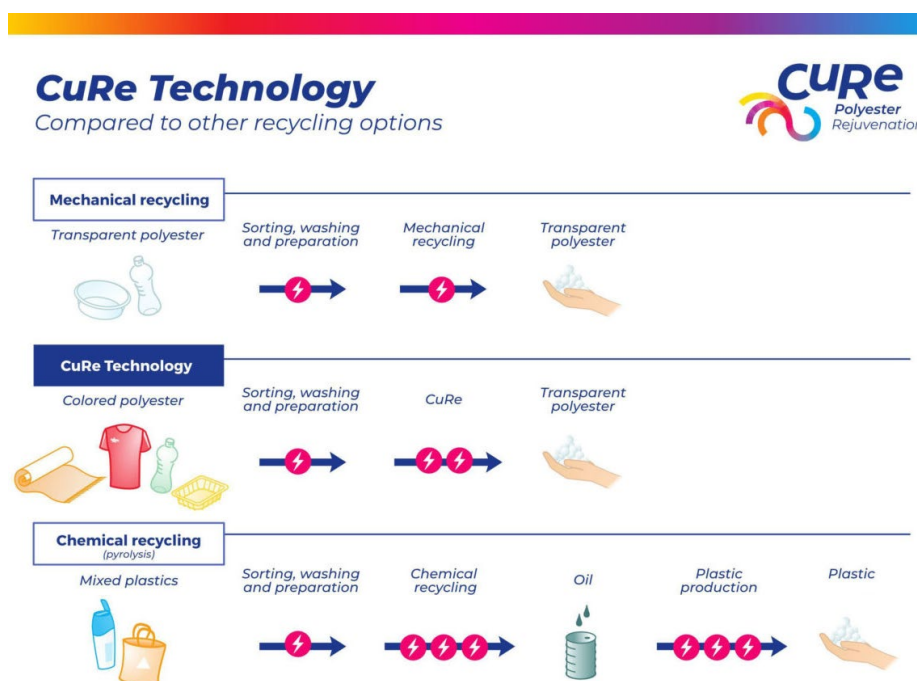
Publication date: 2024-08-29

Applicant(s): CURE TECHNOLOGY B.V. (<https://curetechnology.com/>)

Inventor(s): SCHMIDT BRAM WOLFGANG; KUNST JOHAN ALBERT FRANS; VAN HET GOOR LAYO; BRONS MARCO; RUESINK MARKUS ANTON; PATSOS NIKOLAOS

Summary

The invention presents a novel process for recycling polyester waste materials, particularly polyethylene terephthalate (PET), through a continuous method that involves depolymerization via alcoholysis into oligomeric esters followed by repolymerization in a specially designed reactor. This process maintains a gaseous head space under low pressure conditions, enhancing the interface between the liquid and gas phases, which accelerates the repolymerization process. The resulting polyester exhibits an intrinsic viscosity of at least 0.3 dL/g in less than 120 minutes, with potential for further improvements in viscosity and quality. This method addresses the drawbacks of traditional recycling processes by reducing energy consumption and processing time, while also minimizing thermal degradation, thus producing high-grade recycled polyester suitable for various applications.



<https://curetechnology.com/about-cure-technology/>

Method for regeneration of polyester and recycling of polyester textile waste using a thermal treatment

Patent number: WO2025/181100

Publication date: 2025-09-04

Applicant(s): REVALYU RESOURCES GMBH

Inventor(s): AMRUTKAR AJAY; MINDHE SHIVAJI PARSHRAM

Summary

The invention provides a novel process for recycling polyester fragments, particularly polyethylene terephthalate (PET), which involves a series of steps including thermal treatment and contact with organic liquids. This process effectively reduces the concentration of textile chemicals, such as dyes and finishers, in the polyester fragments, resulting in a further polyester fragment that is purer and more suitable for producing high-quality polyester products. The method addresses significant ecological concerns associated with PET waste and offers a more energy-efficient alternative to traditional chemical recycling methods. The resulting polyester solids can be utilized in various applications, including textiles, containers, and films, thereby contributing to sustainable practices in the polyester industry.

No.	Fabric (F) (Temp.)	Organic Liquid (OL) (Temp.)	F/OL ratio	Speed and extent of decolouration
1	0.45 gms (30 °C)	4.8 gms Chlorobenzene (30 °C)	1:10	Speed: + Extent: +
2	0.95 gms (30 °C)	10 gms Chlorobenzene (120 °C)	1:10	Speed: ++ Extent: +
3	0.69 gms (120 °C)	6.8 gms Chlorobenzene (30 °C)	1:10	Speed: ++ Extent: +
4	0.70 gms (70 °C)	6.9 gms Chlorobenzene (120 °C)	1:10	Speed: ++ Extent: +
5	0.80 gms (120 °C)	8.0 gms Chlorobenzene (120 °C)	1:10	Speed: +++ Extent: +++
6	1.0 gms (120 °C)	7.1 gms Chlorobenzene (120 °C)	1:7	Speed: +++ Extent: ++ - +++
7	0.99 gms (30 °C)	7.0 gms Chlorobenzene (120 °C)	1:7	Speed: ++ Extent: <+

Process for recovery of a polyethylene terephthalate-based polymer from a polymeric material

Patent number: WO2024/260991

Publication date: 2024-12-26

Applicant(s): BASF SE

Inventor(s): WITZEL SINA; MANGOLD HANNAH STEPHANIE; THIEL INDRE; VON VACANO BERNHARD ULRICH; GARCIA ROMERO IVAN

Summary

This invention presents a novel process for the recovery of polyethylene terephthalate (PET) from polymeric materials, utilizing a solvent system that includes N-butylpyrrolidone. The method involves providing a polymeric material containing PET, contacting it with the solvent at a controlled temperature below the solvent's boiling point, and subsequently re-obtaining the PET. The process is designed to ensure that the molecular weight of the recovered PET is equal to or greater than that of the original material, thus preserving its properties for further applications. This approach addresses the challenges of recycling mixed polymeric waste, particularly in the packaging and textile sectors, by enabling efficient recovery without significant degradation of the polymer. The invention offers significant environmental benefits by promoting the recycling of valuable materials and reducing plastic waste.

Dissolution or Non-dissolution of PET					
	Solvents	Boiling temperature [°C] (at 1013 hPa)	HANSEN parameter*		
			δD	δP	δH
Example (E) #					
1	cyrene	227	18.35	11.25	7.00
2	propylenecarbonate	242	19.25	17.02	5.22
3	caprolactone	235	17.77	11.43	7.08
4	2,5-Dimethylisoborbidine	235	17.59	11.50	6.89
5	N-butylpyrrolidone	241	17.49	9.25	6.20
6	t-butylpyrrolidone	227	17.81	12.53	6.60
7	MMOC	264	17.93	16.13	8.34
8	GVL	205	18.50	14.17	7.93
9	DVL	230	18.43	14.21	8.68
10	GBL	204–206	18.00	15.97	7.63
11	DMSO	189	17.80	16.56	10.37
12	Rhodiasolv®PolarClean	278–282	16.28	8.90	7.84
13	caprolactam	270	18.90	13.09	7.79

Systems for decoloring and recycling pure fibers

Patent number: US20240417891

Publication date: 2024-12-19

Applicant(s): LOOPTWORKS INC (<https://looptworks.com/>)

Inventor(s): YIP HOI TING; LI SHENG YAN; CHEUNG PATRICK; HAMLIN SCOTT

Summary

The present invention provides a comprehensive textile recycling process and system that addresses the growing challenges of textile waste management. By implementing a sophisticated sorting module, the system effectively categorizes incoming textiles into distinct fabric streams based on type and color. Each fabric stream undergoes tailored treatment processes, including decoloring and sanitization, to ensure the production of hygienically clean and pure fibers. The mechanical recycling phase further transforms these treated fabrics into recycled fibers suitable for various applications. This innovative approach not only enhances recycling efficiency but also significantly reduces environmental impact by minimizing waste and optimizing resource utilization.

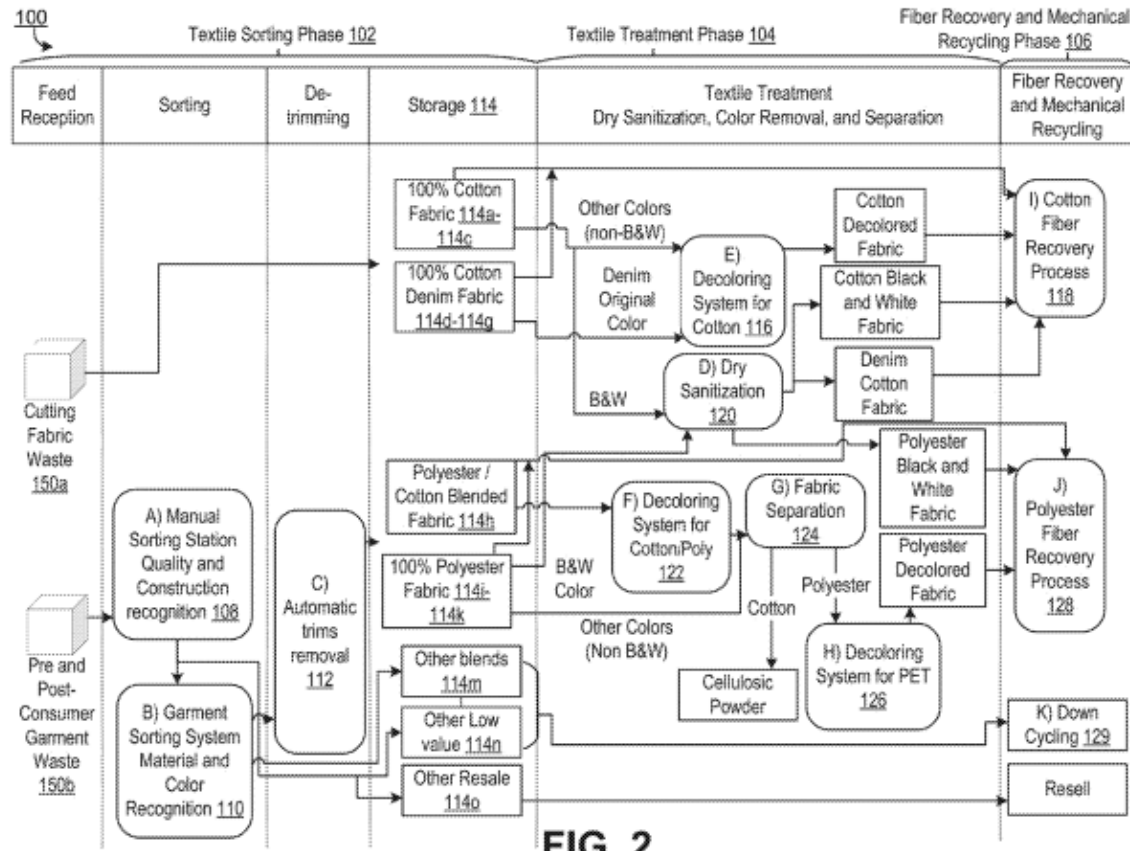


FIG. 2

Method for room temperature depolymerization of terephthalic polyesters to terephthalate esters

Patent number: EP4504830

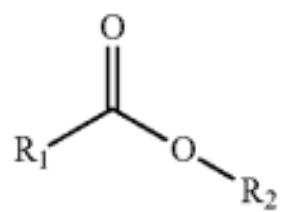
Publication date: 2025-02-12

Applicant(s): RECYCELIT (<https://www.recyc-elit.com/en>)

Inventor(s): EL MAHDI AYOUB; MEDIMAGH RAOUF; FOURDIN THÉO

Summary

The invention presents a novel process for recycling terephthalate polyester materials, specifically polyethylene terephthalate (PET) and polybutylene terephthalate (PBT), into terephthalate diesters such as dimethyl terephthalate (DMT). This process involves a two-step method: first, grinding or shredding the material to create fragments, followed by a depolymerization step using a catalyst, a polar solvent, and an alcohol. The process is characterized by its efficiency, requiring no pretreatment and operating at room temperature or up to 70 °C for a duration of 1 minute to 4 hours. The method is environmentally friendly, producing high-purity products suitable for direct reuse, and addresses the challenges of recycling mixed polymer materials by allowing for the recovery of other components in their original form.



Effect of varying the solvent/alcohol type on the conversion rate						
R1/R2						
% Base	CH ₃ /CH ₃	CH ₃ /C ₂ H ₅	nC ₃ H ₇ /CH ₃	C ₄ H ₉ /CH ₃	C ₄ H ₉ /C ₂ H ₅	CH ₃ / <i>iso</i> prop
7.5%	97%	—	—	—	—	—
10%	—	94%	—	—	—	—
15%	99%	99%	—	—	—	—
20%	99%	99%	95%	93%	—	—
35%	99%	99%	—	—	85%	99%

A method of recycling at least a portion of a textile material comprising polyester fibers, and a system intended therefore

Patent number: WO2025/149614

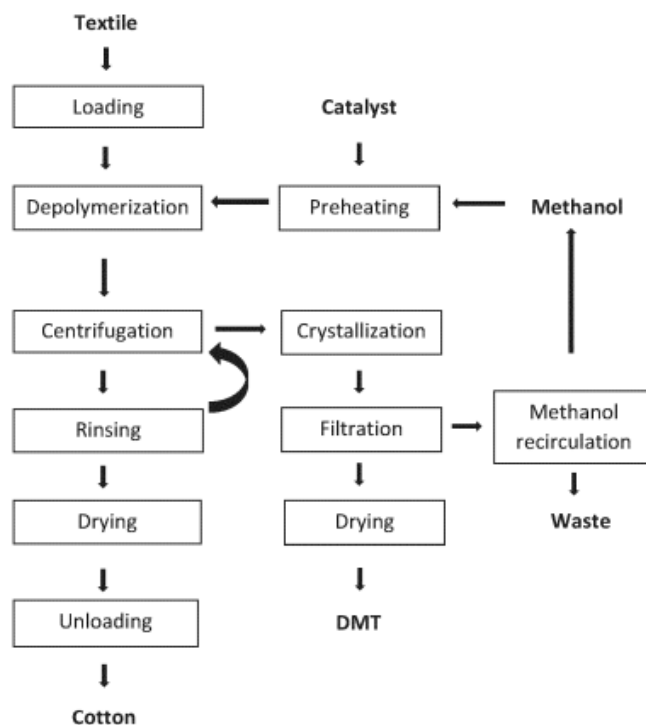
Publication date: 2025-07-17

Applicant(s): INTER IKEA SYSTEMS B.V.

Inventor(s): LINDQVIST KARIN; TÖNNERFORS ERIKA

Summary

This invention presents a novel method and system for recycling textile materials that consist of polyester fibers and at least one other type of fiber. The method involves preheating a reaction liquid containing methanol and a catalyst, followed by loading the textile into a reactor where a methanolysis depolymerization reaction occurs at elevated temperatures. This process not only facilitates the efficient recovery of depolymerized polyester but also ensures that the other fibers remain intact. The system is designed to operate under specific temperature and pressure conditions, enhancing the overall efficiency and effectiveness of the recycling process. By utilizing this method, the invention aims to contribute to more sustainable textile waste management practices.



A method and system for recycling at least a portion of a textile material comprising polyester fibers

Patent number: EP4555013

Publication date: 2025-05-21

Applicant(s): Inter IKEA Systems B.V.

Inventor(s): LEHADUS MARIUS; LINDQVIST KARIN; TÖNNERFORS ERIKA

Summary

This invention presents a novel method and system for recycling textile materials that include polyester fibers. The method employs a rotatable drum reactor to facilitate the mixing of textile materials with a catalyst and methanol, followed by a controlled depolymerization process at specified temperatures and pressures. This process effectively separates the polyester from other fiber types, such as cellulose-based fibers, while maintaining their structural integrity. The system is designed to optimize the recycling process by incorporating features such as perforated drums for efficient liquid separation, inert atmospheres to prevent unwanted reactions, and mechanisms for recovering methanol and catalysts. The invention significantly enhances the efficiency and sustainability of textile recycling operations.

