

ABSTRACT

Deep eutectic solvent as a solution for polyester/cotton textile recycling

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The European Green Deal aims to transform the EU into a resource-efficient and climate-neutral economy by 2050 through more sustainable production and consumption systems. However, the increasing use of complex textile blends presents a significant challenge for achieving circularity in the textile sector. Modern fabrics often combine multiple fibre types to improve properties such as durability, comfort, and performance. While textiles composed of a single polymer can be recycled mechanically or chemically into valuable secondary materials, recycling blended textiles remains technically difficult. Among these, polyester/cotton blends are the most widely produced, yet their separation without damaging fibre quality is particularly challenging.

To address this issue, a novel recycling process has been developed that enables the separation of cotton and polyester while preserving their polymeric structure and material properties. Unlike conventional recycling methods that degrade one component into monomers, this approach maintains both materials at a higher level in the value chain: cotton retains its fibrous structure and polyester remains in its polymeric form. The process is based on an innovative green solvent system composed of non-toxic, inexpensive, and readily available substances. The efficiency of the separation and the properties of the recovered materials were evaluated using techniques such as differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). Although currently demonstrated at laboratory scale, the method shows strong potential for industrial application with significant environmental and economic benefits.