Expanding textile recycling beyond cotton: innovations to recycle regenerated cellulose fibers

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Waste textiles are an increasing environmental problem as the production of fibers is steadily growing (exceeding 120 million tons in 2025) and it is estimated than less than 15% of all the used textile products are recycled today. The problem is aggravated by the fact that most current innovators are developing processes that only tolerate cellulose fibers with high degree of polymerization as feedstock. This opens the possibility to recycle cotton, the natural fiber most used in the textile industry today, but it excludes regenerated cellulose fibers, such as viscose or lyocell, whose consumption has been increasing in the past years and it is expected to keep increasing. The main reason for this is that the mechanical properties of cellulosic textile fibers correlate with their degree of polymerization, which creates difficulties in using low degree of polymerization fibers in textile-to-textile recycling processes.

Although regenerated cellulose fibers might not be a suitable feedstock for textile fiber production, their polymeric properties can still be used in other applications, such as 3D packaging materials or the production of certain cellulose derivatives, such as cellulose acetate. Thus, the ShareTex process focuses on transforming regenerated cellulose fibers into a pure and recycled source of cellulose that can be used in other applications, which would reduce their dependence on virgin materials (increased circularity) and fossil-based feedstocks (increased sustainability). We have also developed an alternative solution to recycle regenerated textile fibers even in cases where cellulose cannot be valorized as a polymer: completely depolymerize the fibers to convert them into a sugar solution that can be upgraded to different types of chemicals. For example, such a sugar solution could be upgraded to caprolactam, butanediol or furandicarboxylic acid, which in turn could be used as precursors in the production of new synthetic fibers that can replace fossil-based polyesters or polyamides in the fashion industry. Based on this, it could be said that ShareTex has developed a recycling process that tolerates all cellulosic textile fibers, regardless of their degree of polymerization, as feedstock.