

# Upcycling process brings new life to old jeans

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Credit: American Chemical Society

A growing population, rising standards of living and quickly changing fashions send mountains of clothing waste to the world's landfills each year. Although processes for textile recycling exist, they tend to be inefficient and expensive. Now, researchers have reported in *ACS Sustainable Chemistry & Engineering* an efficient, low-cost method that

can convert waste denim into viscose-type fibers that are either white or the original color of the garment.

Cotton-based clothing, such as denim, makes up a large proportion of [textile](#) waste. Meanwhile, farming cotton consumes land and resources. Efficiently converting waste denim into reusable cotton fibers could help address both of these problems. Previously, researchers have used [ionic liquids](#)—salts that are liquid, not solid—to dissolve cotton textiles into their cellulose building blocks. The cellulose was then spun into new viscose-type fibers that could be woven into textiles. However, ionic liquids are expensive and difficult to work with because of their high viscosity. Nolene Byrne and colleagues wanted to find a way to reduce the amount of ionic liquid solvent required to recycle denim into regenerated [cellulose fibers](#).

The researchers ground three textile samples (blue denim fabric, red [denim](#) pants and a mixed-color T-shirt) into powders. Then, they dissolved the powders in a 1:4 mixture of the ionic liquid 1-butyl-3-methylimidazolium acetate and dimethyl sulfoxide (DMSO). Using a high concentration of DMSO as a co-solvent allowed the researchers to use much less ionic liquid than other methods. In addition, DMSO reduced the viscosity of the ionic liquid solution, making it easier to spin the [cellulose](#) into new fibers. Because DMSO is much cheaper than the ionic liquid, the new process reduced the cost of solvent by 77%. When they pre-treated the textile powders with a sodium hydroxide solution, the researchers could produce white viscose-like fibers. Without this step, the fibers retained the color of the original item, which conserves water and energy that would otherwise be required for textile dyeing.

**More information:** Yibo Ma et al. Circular Textiles: Closed Loop Fiber to Fiber Wet Spun Process for Recycling Cotton from Denim, *ACS Sustainable Chemistry & Engineering* (2019). [DOI](#):

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