



Why scientists think they may finally have found a way to recycle clothes

It's almost impossible to turn old threads into new clothes, but scientists are working to change that.

[Nicolás Rivero](#) Washington Post July 5, 2024

Nearly all your clothes will wind up burned or in a landfill — but scientists are coming up with new ways to recycle those fabrics into new clothes or useful products.

A critical step, though, will be figuring out how to handle blended fabrics that combine different materials, mainly cotton and polyester, into one piece of cloth. Once the fibers are blended together, it's hard to separate one material from the other so that each can be recycled separately.

Researchers at the University of Delaware are [proposing a new recycling technique](#) that breaks down blended fabrics using chemicals and microwaves. The researchers say the process takes 15 minutes and can dissolve any blend of cotton, polyester, nylon and spandex into molecules that can be used to make new fabrics or products like dyes, electronics and tires.

Catchall recycling techniques like this one could be a last line of defense to keep clothing out of the dump, according to Tasha Lewis, an associate clinical professor in fashion and retail studies at Ohio State University. There are other solutions to fashion waste that are simpler and cheaper: People can buy secondhand clothing and make their wardrobes last longer. Companies can make garments more durable and make them out of one material so they're easier to recycle. Worn-out textiles can be chopped up and used as insulation in buildings.

But when there are no other options, chemical recycling could save the day. "This would be the final stage for the leftovers that just have no other purpose," said Lewis.

The state of textile recycling

The need to recycle clothing is becoming more urgent along with the rise of [fast fashion](#), the business model where retailers churn out cheap, flimsy clothes quickly to keep up with ever-changing fashion trends. The world now throws out [92 million tons of clothes a year](#) and only [about an eighth of it gets recycled](#), according to an analysis from the Ellen MacArthur Foundation, a nonprofit focused on recycling. The rest winds up in landfills or incinerators where it pollutes the air and water.

Most of the clothes that are recycled get “downcycled,” meaning they’re shredded into a less valuable material that’s used for things like padding or insulation. [Less than 1 percent](#) of all garments get turned into a new piece of clothing, according to the Ellen MacArthur Foundation.

That rare form of recycling is key to many environmentalists’ and fashion designers’ vision for a future where most clothes are made from recycled materials and the same fibers can be used again and again in new garments.

“Ideally, if we recycled all textile waste, we would have enough materials forever and we wouldn’t need to produce new materials,” said Miriam Ribul, a senior research fellow in Materials Circularity at the Royal College of Art in London.

Today, that happens in a small number of facilities that take old fabric and turn it into new fibers and yarns. Just as glass and metal can be melted down and remolded into new products, synthetic fabrics like polyester can be melted into plastic pellets and turned back into fibers. And just as paper can be churned into pulp and rolled into new sheets, natural fibers like cotton can be shredded and spun into new yarns.

Most of these plants focus on just one type of material, such as cotton or polyester, and some struggle to find companies willing to buy their recycled threads, which are often lower quality than new fabrics. Renewcell, a Swedish start-up that opened a plant to turn old cotton into new rayon in 2022, [filed for bankruptcy](#) in February.

What about blended fabrics?

The challenge is even harder for blended fabrics that have to be separated before they're recycled. "The fashion industry is not always transparent about what's in their clothes," said Erha Andini, the lead author of the University of Delaware study on recycling blended textiles. It's common for retailers to weave a little spandex or nylon into modern garments to make them stretch and help them fit — but they don't always say so on the tag. Companies also rarely list the dyes and finishes they add to fabrics to make them wrinkle-resistant or waterproof.

To deal with complicated clothes with mysterious materials, Andini and her colleagues developed a chemical recycling process that strips fabrics down to their molecular studs. Using microwaves and chemical solvents, the researchers can break the bonds that hold synthetic fibers together, leaving behind the basic molecules used to make polyester, nylon and spandex, along with intact cotton fibers. The molecules can be turned back into fibers for clothing, or used to make other products such as seat belts and air bags.

Unlike with existing recycling methods, researchers can use this technique even if they don't know exactly what's in a piece of clothing. But they've only demonstrated it in a lab. They say it may take a decade or more for companies to turn the idea into a profitable business.

In the meantime, experts say, the fashion industry should also think about other ways to curb waste, such as making garments out of one material so that they're easier to recycle and making less clothing in the first place. "We can't just recycle our way out of this issue," said Sophie Scanlon, a textiles specialist at WRAP, a British nonprofit focused on waste. "We really need to tackle the root issue of, why are we producing and consuming greater and greater quantities of clothing?"

