Is Silicone the Answer to Phase Out PFAS?

GREEN THEME TECHNOLOGIES' PFAS-FREE, WATER-REPELLANT TREATMENT. **COURTESY**

While many agree that removing potentially harmful per- and polyfluorinated substances (PFAS) from textiles makes sense, the question remains: How do you achieve the same level of performance without them? Particularly with oil-repellency, the search for a PFAS-free replacement has proved difficult.

A group of chemists and scholars gathered last week in Raleigh, N.C., to discuss solutions to that problem at the American Association of Textile Chemists and Colorists' (AATCC) PFAS in Textiles Conference.

One of the most promising solutions proposed by several presenters was silicone.

PFAS chemicals work well in repelling oil due to their long-chain structure, referring to the length of the carbon backbone in the molecule. These long-chain PFAS are commonly referred to as "forever chemicals" since it takes them so long to break down, if at all.

According to Kevin Golovin, assistant professor of mechanical engineering at the University of Toronto, those longer chain (C8 and up) PFAS work so well at repelling stains and water because their length allows them to pack tighter along the surface of a fabric, creating an impermeable barrier.

"The service science term for this is self-assembled monolayers or SAMs," he said. "That is the way that the industry basically until today has achieved oil repellency—by forming these self-assembled poly layers where we see groups packed on the surface."

Golovin outlined research at the University of Toronto that looked into the oleophobic properties of PFAS compared to other finishes, such as C6s, waxes and silicone. The team came up with a means of manipulating the molecular flexibility of silicone to make a new configuration called a brush.

"We have single chains of silicone sticking straight up off the surface, and the idea was if these are packed together close enough, there's just no room for oil to get in between the chains," Golovin said.

Golovin says the researchers have been working on this for the past six years, and have proved their hypothesis correct, with the

silicone brushes repelling oil about as well as PFAS would.

“We put the silicone finish on the fabric in this very thin DWR (durable water repellent) so you can’t see it, and when you put droplets of oils on the fabric, you get the repellency,” he said.

The push to find viable alternatives to PFAS for water and oil repellency has ramped up in recent years as several states—including California, Maine, Vermont and Washington—have passed legislation regulating the use of the chemicals in consumer products.

PFAS chemicals can leech into the soil and water during production, and according to the U.S. Environmental Protection Agency (EPA), PFAS are found in the blood of people and animals all over the world and are present at low levels in a variety of food products. Of the thousands of PFAS chemicals in existence, some have been linked to harmful health effects including cancer and reproductive issues.

Many companies, from apparel makers to home textiles, have phased PFAS out of their products. And some are turning to silicone solutions to provide performance properties to fabrics. Upholstery maker Nassimi, for instance, has completely phased out PFAS from its textiles, and the company uses a silicone solution to provide liquid repellency to its Supreen performance fabric.

“We’ve learned the natural ability of silicone to repel stains, and we’ve taken that knowledge and we put it into a C zero that works as well as anything in the market—it is resistant to both water and oil,” said Debbye Lustig, vice president, Nassimi.

And while silicone can have a sticky, rubbery feel, Lustig said Nassimi runs its yarn through a proprietary purification process prior to the silicone solution bath, which helps the finish not only adhere to the fibers, but also retain a soft, natural-feeling hand.

Dow uses silicones in its DOWSIL IE-8749 emulsion, which is a sustainable silicone DWR for fashion and technical textiles, as well as its silicone hybrid DOWSIL IE-9100 emulsion, which offers a softer hand and improved logo printability. But those products are only water repellent and don’t resist oil.

To address that second need Dow is developing a durable water and oil repellent using silicones that has yet to hit the market. However, Jacob Milne of Consumer Solutions, a business unit of Dow, said current prototypes are demonstrating durable oil repellency.

“We’ve tested this material in a number of fabrics—your synthetics, nylons, polyesters, etc., as well as cottons and whatnot,” he said.

Golovin said this kind of research and

development with silicone should continue, as the material has shown great promise in providing repellency on par with PFAS finishes.

“In the medium term, I think we should focus on the durability of fluorine-free silicone finishes,’ Golovin said. “We’ve been working on this, and I think it’s an important thing to do.”

As the discussion of PFAS alternatives drew to a close at the conference, Sudhakar Puvvada—a veteran of VF Corp. and co-founder of Dream Catcher Innovation Labs—urged those working on these solutions to PFAS-free DWORs to keep pushing the bounds of science and innovation.

“With these new technologies, you don’t just make one product and walk away from it,” he said. “There has to be some investment and patience to keep that innovation moving forward.”

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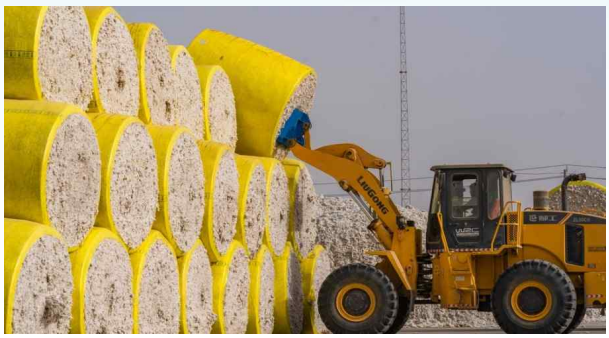
‘Significant’ Volume of Xinjiang Cotton Mislabeled as US or Brazilian



A MACHINE STACKS BUNDLES OF COTTON AT A COTTON GINNING MILL ON NOV. 10, 2021 IN YULI COUNTY, BAYINGOLIN MONGOL AUTONOMOUS PREFECTURE, XINJIANG UYGUR AUTONOMOUS REGION OF CHINA. **VCG/VCG VIA GETTY IMAGES**

Forced-labor-linked cotton from China’s Xinjiang Uyghur Autonomous Region is still sneaking its way into products sold by U.S. and global retailers, with a sizable portion hidden in blended fibers identified as American or Brazilian in origin, a new report has found.

That 19 percent of more than 820 cotton-containing samples, purchased and probed over a year, tested positive for Xinjiang cotton is “significant,” particularly in the wake of its ban in the United States under the two-year-old Uyghur Forced Labor Prevention Act.said MeiLin Wan, vice president of textile sales at DNA authentication firm Applied DNA Sciences.

“If it was 5 or 10 percent, I’ll be saying, ‘Maybe that’s just an artifact,” said Wan, whose company conducted the study with isotopic analysis lab Stratum Reservoir. “But the fact that it sort of this one-in-five number is similar to what people have been recording and guesstimating.”

Isotopic testing is similar to a fingerprint comparison, except the fingerprints are the stable isotopes of chemical elements like carbon, oxygen, nitrogen and hydrogen. In 2022, German scientists used isotopic techniques to uncover traces of Xinjiang cotton in T-shirts and button-downs from Adidas, Puma and Hugo Boss, even though brands say they no longer source materials or products there.

Wan was referring to the oft-quoted statistic that one in five cotton garments sold globally contains Xinjiang cotton. China derives some 90 percent of its cotton from the northwestern province, where authorities have been accused of engaging in the widespread persecution and modern-day enslavement of Uyghurs and other Turkic Muslim minorities, though Beijing adamantly denies this. Chinese cotton, in turn, makes up roughly 20 percent of the world’s production of the white fluff.

Applied DNA Sciences and Stratum Reservoir’s finding also lines up with the 15 percent positivity rate that Customs and Border Protection, or CBP, found across 86 tests that it commissioned in December 2022 and April and May 2023, the results of which Reuters

obtained through a Freedom of Information Act request. While the tested items had their brand names redacted, their descriptions identified garments such as jeans, T-shirts, dresses, boxers and baby onesies.

The latest investigation took off from there, Wan said. What if someone tested more than 86 items? And what if that same person didn't look at only finished clothing but also yarns, fabrics, canvas footwear, socks and home textiles like kitchen towels and curtains that were not only U.S.-bound but could offer a "global bird's eye view"?

Wan said that the companies decided to keep the identities of the offending brands under wraps, partly for legal reasons ("we obviously don't want to be sued") and partly because they wanted to be "helpful" rather than name and shame. She did note, however, that at least one-quarter of the samples would have entered the United States under the so-called de minimis "loophole," which frees small packages valued at less than $800 from paying taxes, fees or tariffs and—crucially—subjects them to less scrutiny even though they're not exempt from the UFLPA. A whopping 685 million of these packages inundated the country in 2022 alone, according to CBP.

Kimberly Glas, president and CEO of the National Council of Textile Organizations, a Washington, D.C and North Carolina-based trade group, wants to see de minimis shut down. It's her opinion that the exemption is fueling forced labor and unfair environmental practices, as well as facilitating the trafficking of guns and illicit drugs like fentanyl. The same cheap shipments from China are also undercutting the competitiveness of domestic textile manufacturers, 16 of which have closed in the past several months. For Glas, this is nothing short of a "five-alarm fire situation."

"This underscores the alarm that the industry has been raising for months about the infiltration of Xinjiang cotton into the United States," she said of the assessment. "It's literally it sitting in our closet being delivered to our doorsteps and UFLPA enforcement has been anemic. The penalties for UFLPA violation have been anemic."

Wan said that the 19 percent figure wasn't too surprising—China, after all, churns out a lot of yarn and fabric. What, in her words, "shocked" her, however, was the fact that 57 percent of the positive samples claimed to hail from the United States, followed by 12 percent from Brazil, 11 percent from Chinese provinces outside Xinjiang and 9 percent from Australia. At the same time, roughly half of China's cotton imports come from Brazil and the United States, which means if there is any blending with domestic cotton to make up quantities, "it's going to happen," whether intentionally or not, Wan said.

"On the flip side, if you think about it, if there was going to be blending of cotton, wouldn't U.S. cotton be the biggest target because of the UFLPA?" she said. "It may be that if people claim U.S. origin, they feel it won't be checked or tested. This is not just a forced labor issue; this is a [Federal Trade Commission]-labeling issue."

Rooting out Xinjiang cotton despite the UFLPA, Canada and Mexico's modern slavery restrictions under the United States-Mexico-Canada Agreement and the European Union's forthcoming forced labor regulation won't be easy, said Sheng Lu, associate professor of fashion and apparel studies at the University of Delaware. For one thing, China's national media has reported a 34.6 percent uptick in textile exports from Xinjiang, suggesting "more products containing Xinjiang cotton could be supplied to the world market" despite an increasing number of American fashion companies reducing their exposure to the superpower, he said.

"The findings reveal the daunting tasks of removing Xinjiang cotton from the supply chain and the additional technical support and practical tools fashion brands and retailers need to ensure no forced labor in the supply chain," Lu said. China might also be getting around the U.S. blockade by increasing exports of non-cotton apparel. The first quarter of 2024 saw man-made fibers constitute 61.4 percent of China's total apparel exports to the United States, a "notable rise" from the 55 percent reported in 2018, he said.

A 2021 report from the Helena Kennedy Centre for International Justice at Sheffield Hallam University also warned of "cotton laundering" through transnational trade that obscures the fiber's true origin, allowing it to seep into the clothing of brands that have released statements insisting that they don't source cotton, textiles or garments from Xinjiang or tolerate forced labor in any form.

"Just imagine a bucket of paint, right?" Wan said. "It starts off as blue. And as you start to add green, yellow, red, brown [and] purple, [it's hard to] figure out what origin it has because you've got so many. That's why recycled cotton is not easy to verify because they're blending it and taking the fibers from God knows where. So truly unknown origins."

At a House Committee on Homeland Security hearing in January, Eric Choy, CBP's executive director for trade remedy and law enforcement, revealed that the agency has established an isotopic testing lab in Savannah, Ga.—it was previously using the New Zealand verification company Oritain, which also tests for brands like popular de minimis-reform target Shein—with similar setups in New York City and Los Angeles to follow.

Grant Cochrane, CEO of Oritain, said that the issue of "cotton from non-compliant areas" showing up throughout the supply chain isn't new, but that brands that aren't focused on

supply chain traceability face a higher risk.

“Objective verification of supply chain sourcing is critical, and brands cannot rely on vendor self-declaration or mapping to get to the truth of their supply chains,” he said. “Without full transparency over their supply chains, brands may be unknowingly importing non-compliant cotton into the U.S.”

The best way to remove forced labor from the supply chain, Cochrane said, is closer collaboration between everyone within the supply chain ecosystem. That includes brands, suppliers and regulators.

Testing is something CBP needs to ramp up, Glas said. She also wants those results to be made public so that perpetrators of Xinjiang-linked or fraudulent imports can be held accountable and future offenses deterred.

“I aspire to be like the electronics industry,” she said. “They had a billion dollars detained last year; we had like $35 million detained when we had well over $100 billion textile and apparel imports come into the United States. What does that say to China? It says we’re not really looking. A 19 percent non-compliance rate is alarming.”

According to CBP’s UFLPA dashboard, border authorities have detained 1,405 shipments, with a combined value of nearly $56 million, since the law took effect in June 2022. Of these, 818 pieces of freight, worth almost $19 million, were ultimately denied entry. Some 351, valued at $27.5 million, were later given the green light.

Because of law enforcement and business sensitivities, CBP doesn’t provide additional information or plans to detain specific goods under the UFLPA. The agency says, however, that its approach to enforcement prioritizes the highest-risk goods, based on real-time data and intelligence, to prevent forced-labor goods from entering the United States.

Wan agreed that there’s a “serious amount of work to be done” beyond the paper documentation trail that the industry has been used to, pitching Applied DNA Sciences’ services, which includes its CertainT platform for “molecular-based security,” as one of the solutions.

“Physical verification of goods is important because there is a sort of global trend towards this blockchain everything and just capture everything digitally and let’s just exchange fiber coins or wherever,” she said. ”But that’s not going to hold water because it’s going to be a flood, right? There’s a flood of goods out there.”

Link

https://sourcingjournal.com/topics/labor/xinjiang-cotton-labeled-us-brazil-forced-labor-applied-dna-510106/

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ECHA chromium VI restriction dossier mandate extended to all 11 substances

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The European Commission has asked ECHA to include all 11 chromium VI substances in the scope of its REACH restriction dossier, extending the mandate from only two initially considered, to avoid potential ‘regrettable substitution’ and a continued flood of authorisation applications.

The executive took the step in a letter to ECHA on 29 April, after the agency presented its first findings and concerns about limiting the scope of the restriction to chromium trioxide and chromic acid.

ECHA told the Commission that some of the uses of other chromium VI substances overlap with the two substances. Operators could avoid the restriction by switching to those that remain in the authorisation regime, the Commission’s letter said.

The nine Annex XIV substances now included and their authorisation list entry numbers are:

- sodium dichromate (18);
- potassium dichromate (19);
- ammonium dichromate (20);
- potassium chromate (21);
- sodium chromate (22);
- dichromium tris(chromate) (28);
- strontium chromate (29);
- potassium hydroxyocta-oxodizincate-dichromate (30); and
- pentazinc chromate octahydroxide (31).

ECHA should investigate whether the risks from chromium VI are better addressed if they are restricted together, considering all relevant factors such as substitution and the extra workload from processing authorisation applications, the Commission said.

The nine substances had received 79 authorisation applications as a total by the end of last year with the potential to increase if operators switch to them to avoid a ban. Chromium trioxide has so far received 193 applications, but over 1,000 more are expected in the next five to ten years.

The Commission also asked ECHA to include substances not listed in Annex XIV but that have "the potential to lead to regrettable substitution", in particular barium chromate.

The extended mandate does not include the three lead chromate entries, which are pigments used in paints.

Extended timeframe

Due to the additional work from the expanded scope, the Commission has also extended the timeframe for ECHA to complete the restriction dossier from 12 months to 18 months.

The agency is now expected to submit this by 11 April 2025.
This may push back its adoption from September 2026, which the Commission had previously said was the best-case scenario.

ECHA said it will open a second call for evidence in June. It will also run a webinar on 6 June to discuss the outcomes of the first call and highlight the additional data requested in the second call.

The Commission's unprecedented decision last October to move the substances from authorisation to restriction, followed a legal defeat last year when an EU court annulled an upstream authorisation. This left hundreds of downstream companies in chrome-plating and surface treatment industries looking for an alternative solution to continue using the chemical.

Moving the substances to the restriction list would stave off the deluge of individual applications already consuming a massive portion of Commission staff resources dedicated to REACH and causing lengthy delays. Many say in hindsight chromium VI is not a good fit for the authorisation regime.

Peter Simpson, director at consultant Affinity Element and formerly a restriction process coordinator at ECHA, said it was "far better" to extend the scope now rather than after the proposal was submitted, necessitating further restrictions.

However, any delay increases the uncertainty already facing industrial users of the substances. Many companies are unsure whether to apply for authorisation or wait for the restriction to be adopted.

"In the absence of an agreed restriction, companies need to carry on with the existing legal framework. They may decide that applying [for authorisation] is the route with least regulatory uncertainty," Simpson told Chemical Watch News & Insight.

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https://product.enhesa.com/1077668/echa-chromium-vi-restriction-dossier-mandate-extended-to-all-11-substances

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