No more washing: Nano-enhanced textiles clean themselves with light

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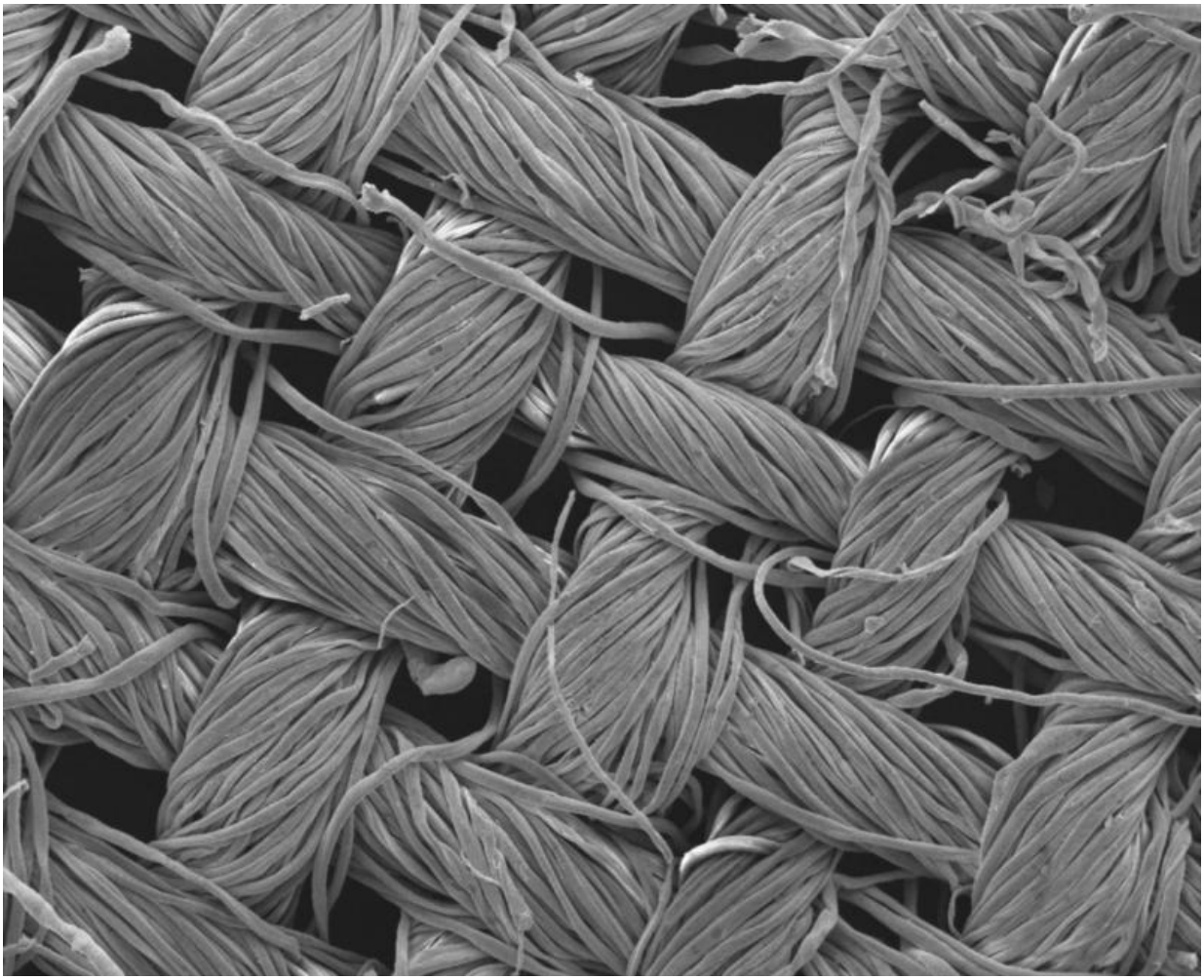


Cotton textile covered with nanostructures invisible to the naked eye. Image magnified 200 times. Credit: RMIT University

A spot of sunshine is all it could take to get your washing done, thanks to pioneering nano research into self-cleaning textiles.

Researchers at RMIT University in Melbourne, Australia, have developed a cheap and efficient new way to grow special nanostructures —which can degrade organic matter when exposed to light—directly onto textiles.

The work paves the way towards nano-enhanced textiles that can spontaneously clean themselves of stains and grime simply by being put under a light bulb or worn out in the sun.

Dr Rajesh Ramanathan said the process developed by the team had a variety of applications for catalysis-based industries such as agrochemicals, pharmaceuticals and natural products, and could be easily scaled up to industrial levels.

"The advantage of textiles is they already have a 3D structure so they are great at absorbing light, which in turn speeds up the process of degrading organic matter," he said.

"There's more work to do to before we can start throwing out our washing machines, but this advance lays a strong foundation for the future development of fully self-cleaning textiles."

The researchers from the Ian Potter NanoBioSensing Facility and NanoBiotechnology Research Lab at RMIT worked with copper and silver-based nanostructures, which are known for their ability to absorb visible light.

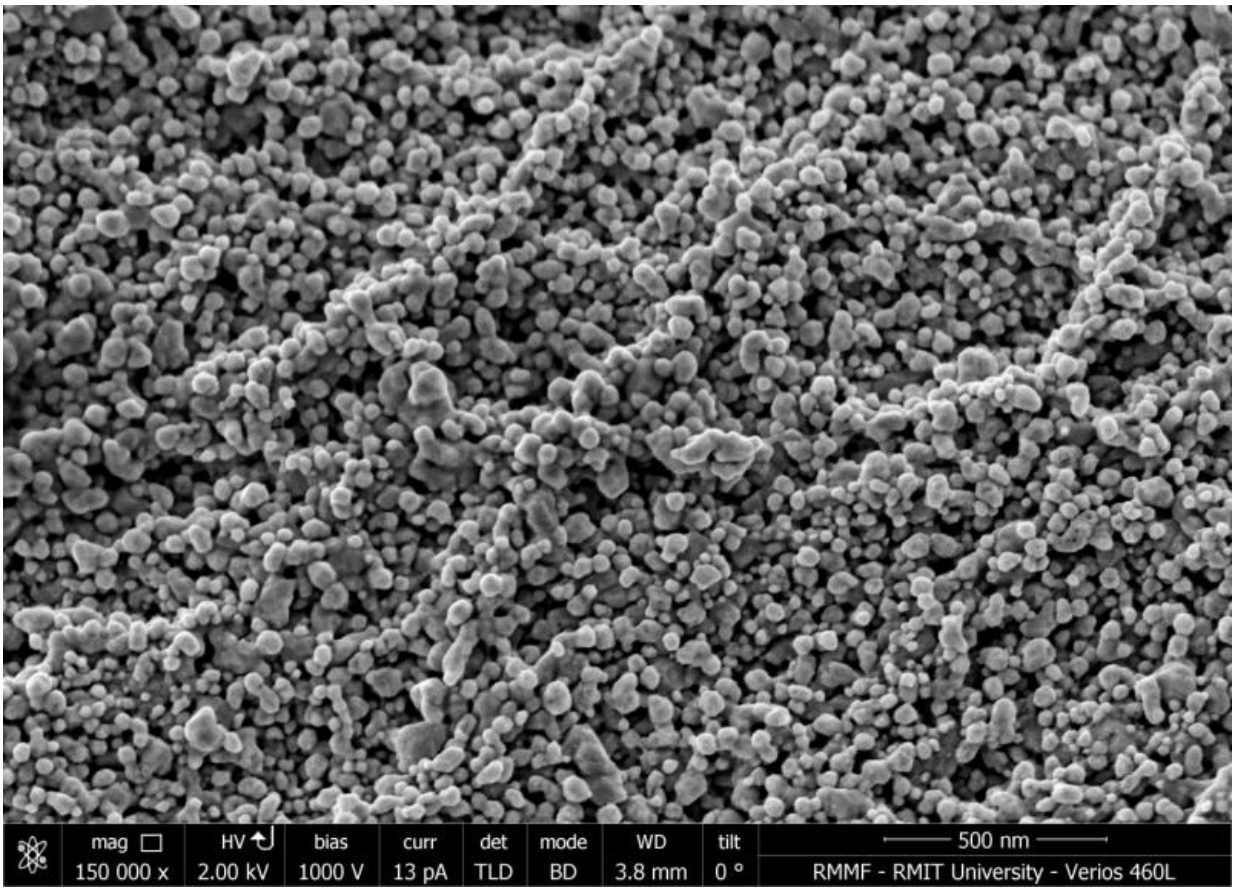
The red color indicates the presence of silver nanoparticles -- the total coverage on the image shows the nanostructures grown by the RMIT team are present throughout the textile. Image magnified 200 times. Credit: RMIT University

When the nanostructures are exposed to light, they receive an energy boost that creates "hot electrons". These "hot electrons" release a burst of energy that enables the nanostructures to degrade organic matter.

The challenge for researchers has been to bring the concept out of the lab by working out how to build these nanostructures on an industrial

scale and permanently attach them to textiles.

The RMIT team's novel approach was to grow the nanostructures directly onto the textiles by dipping them into a few solutions, resulting in the development of stable nanostructures within 30 minutes.



Close-up of the nanostructures grown on cotton textiles by RMIT University researchers. Image magnified 150,000 times. Credit: RMIT University

When exposed to light, it took less than six minutes for some of the nano-enhanced textiles to spontaneously clean themselves.

"Our next step will be to test our nano-enhanced textiles with organic compounds that could be more relevant to consumers, to see how quickly they can handle common stains like tomato sauce or wine," Ramanathan said.

The research is published on March 23, 2016 in the high-impact journal *Advanced Materials Interfaces*.

More information: Samuel R. Anderson et al. Robust Nanostructured Silver and Copper Fabrics with Localized Surface Plasmon Resonance Property for Effective Visible Light Induced Reductive Catalysis, *Advanced Materials Interfaces* (2016). DOI: 10.1002/admi.201500632

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