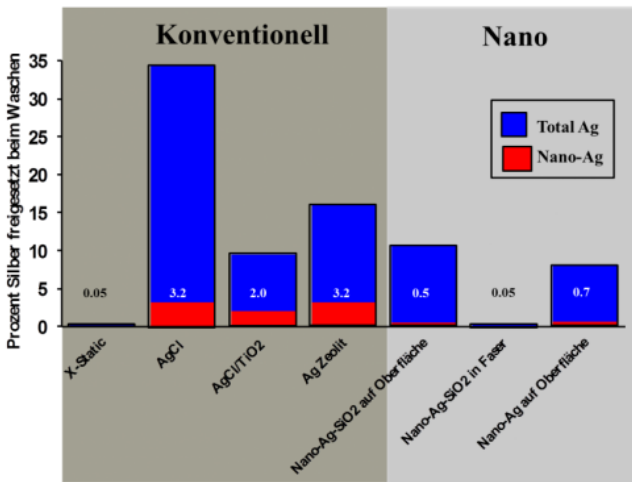


Silver in the washing machine: Nanocoatings release almost no nanoparticles

30 June 2014



This graph represents the percentage of silver coating that is washed out during a laundry cycle (blue) and percentage of nano-particles (red). Textiles coated with nano-silver release fewer nano-particles than those with conventional coatings. Credit: Empa

The antibacterial properties of silver-coated textiles are popular in the fields of sport and medicine. A team at Empa has now investigated how different silver coatings behave in the washing machine, and they have discovered something important: textiles with nano-coatings release fewer nano-particles into the washing water than those with normal coatings.

If it contains 'nano', it doesn't primarily leak 'nano': at least that's true for [silver](#)-coated textiles, explains Bernd Nowack of the Technology and Society division at Empa. During each wash cycle a certain amount of the silver coating is washed out of the textiles and ends up in the [waste water](#). Empa analysed this water; it turned out that nano-coated textiles release hardly any nano-particles. That's quite the opposite to ordinary coatings,

where a lot of different [silver particles](#) were found. Moreover, nano-coated silver textiles generally lose less silver during washing. This is because considerably less silver is incorporated into textile fabrics with nano-coating, and so it is released in smaller quantities for the antibacterial effect than is the case with ordinary coatings. A surprising result that has a transformative effect on future analyses and on the treatment of silver textiles. "All silver textiles behave in a similar manner - regardless of whether they are nano-coated or conventionally-coated," says Nowack. This is why nano-textiles should not be subjected to stricter regulation than textiles with conventional silver-coatings, and this is relevant for current discussions concerning possible special regulations for nano-silver.

But what is the significance of silver particles in waste water? Exposed silver reacts with the (small quantities of) sulphur in the air to form silver sulphite, and the same process takes place in the waste [water treatment plant](#). The silver sulphite, which is insoluble, settles at the bottom of the sedimentation tank and is subsequently incinerated with the sewage sludge. So hardly any of the silver from the waste water remains in the environment. Silver is harmless because it is relatively non-toxic for humans. Even if silver particles are released from the textile fabric as a result of strong sweating, they are not absorbed by healthy skin.

Which detergent for which coating?

Next, Nowack's team wants to investigate how silver textiles respond to various ordinary laundry detergents. Studies have shown that some active ingredients of laundry detergents can alter the form in which silver is present. For example, before washing researchers have detected silver ions, i.e. dissolved silver (a conventional form of silver) in textile fabrics, whereas after washing they detected

elemental, i.e. metallic, nano-silver or other silver compounds, such as (insoluble) silver chloride.

So silver textiles ultimately contain a number of silver compounds that constantly change and undergo chemical transformations. And they don't just do that during washing, as Nowack stresses.

Even during the manufacturing and coating processes, external influences can have an effect on the composition of the silver particles in textiles, even before the customer has got the product hanging in their wardrobe at home.

More information: Presence of Nanoparticles in Wash Water From Conventional Silver and Nano-Silver Textiles, Denise M. Mitrano, Elisa Rimmele, Adrian Wichser, Rolf Erni, Murray Height, Bernd Nowack, *ACS Nano*, DOI: [10.1021/nn502228w](https://doi.org/10.1021/nn502228w)

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