Spinning up antibacterial silver on glass

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The antibacterial effects of silver are well established. Now, researchers at Yonsei University in Seoul, Republic of Korea, have developed a technique to coat glass with a layer of silver ions that can prevent growth of pathogenic bacteria including *Escherichia coli*, *Salmonella typhimurium* and *Campylobacter jejuni*. The technology could be used to protect medical equipment and be particularly useful for applications in disaster recovery and the military environment.

Materials scientist Se-Young Choi and colleagues Cheol-Young Kim, Yu-Ri Choi and Kwang-Mahn Kim, explain in the *International Journal of Nanotechnology* how silver has been known to be an antibacterial substance since the middle of the nineteenth century. It has found applications in bactericidal formulations for medical instruments and even odor-destroying socks

A big advantage of the use of this substance rather than organic agents against bacteria is that bacteria are yet to evolve resistance to it whereas genetic mutations that lead to proteins that can assimilate and degrade organic compounds frequently arise. As such, silver solutions have been used widely as disinfectants, in water purification in and in dentistry. Scientists have demonstrated that silver ions can latch on to sulfur-containing thiol groups in bacterial biomolecules disrupting their activity and thereby killing the microbes. Finding a way to add a permanent silver ion coating to glass would expand the antibacterial repertoire much further allowing a wider range of medical instruments, drinking vessels and other equipment to be kept sanitary regardless of working conditions.

The Seoul team has now developed a way to "spin" coat glass with silver present in a so-called sol-gel, a type of gelatinous solution within which are dispersed dissolved silver ions present as their nitrate salt. Spinning takes place at 200 Celsius with a rotation rate of 2000 revolutions per minute. They used atomic force microscopy to demonstrate how a substantial coating could be formed on glass and then successfully tested its activity against various food-poisoning bacteria. The resulting coated glass is more than 90 percent as transparent as uncoated glass bending strength tests show it to be slightly toughened by the presence of the silver coating.

"There are lots of bacteria that can cause serious food poisoning in the military equipment and environments," Choi explains. "So, the antimicrobial activity of the silver ion containing film showed its potential for use as a coating for medical devices and military equipment." The team suggests that the same approach could be used to spin coat other smooth materials.

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