

Black silicon against bacteria

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Microbial contamination is a major challenge in many industries. Hence, novel bactericidal materials are being researched. Studies have shown that the surfaces of wings of dragonflies such as *Diplacodes bipunctata* are covered with nanopillars, making them look like a bed of nails. When bacteria come in contact with these surfaces, their cell membranes get ripped apart immediately and they get killed. Inspired by this study, researchers have developed a nanoparticle out of black silicon with tiny spikes on its surface. Black silicon is a synthetic nanomaterial that has been developed by modifying the surface of silicon. It has properties such as low reflectivity and enhanced absorption and scattering of light. The surface geometry of the material is designed similar to that of the wings of the dragonfly. The pressure these points exert on the bacterial membranes break them while leaving the larger (eukaryotic) cells unharmed. These nanomaterials were tested using different species of bacteria and cells harvested from monkeys' kidneys. The black silicon surface killed the bacteria whereas the animal cells grew significantly. Microscopy observations showed that the bacterial cells underwent simple deformation of their membranes around the tiny spikes leading to their death. Therefore, these nanoparticles can kill Gram positive and Gram negative bacteria as well as endospores. Hence, these nanomaterials have potential applications in biomedical and other industries.

Keywords: Nanopillars, Nanoparticles, Black silicon, Spikes, Bactericides

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