Researchers develop low-cost, 'green' way to make antimicrobial paints

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Researchers at The City College of New York (CCNY) and Rice University have developed a low-cost, environmentally friendly technique for embedding antimicrobial silver nanoparticles into vegetable oil-based paints. The method, to be reported in the March issue (online January 20) of *Nature Materials*, could give homes and workplaces a new defense against germs by applying a fresh coat of paint.

Silver's antibacterial properties have been known for thousands of years, and silver nanoparticles offer superior antibacterial activity while being non-toxic. However, coatings containing antimicrobial agents have failed commercially in the past due to their complex, multi-step preparation methods and high cost of production.

The CCNY/Rice team developed a "green chemistry" approach to synthesize metal nanoparticles in common household paints in situ without using hazardous reagents and solvents. "We extensively worked on poly-unsaturated hydrocarbon chain containing polymers/oils to devise a novel approach to nanoparticle formation" said Dr. George John, Professor of Chemistry at CCNY and lead author of the article.

Polyunsaturated hydrocarbons undergo auto-oxidation-induced cross-linking, which is similar to lipid peroxidation, the process by which fatty acids are oxidized in biological systems. During this process a variety of chemically active species called 'free radicals' are generated. These were used by the group as a tool to prepare metal nano-particles in situ in the

oil medium.

“The simplicity of the process and economics should allow us to commercialize these paints as a versatile coating material for health and environmental applications” says Dr. Pulickel M. Ajayan, Professor of Mechanical Engineering and Materials Science at Houston-based Rice University, and co-author.

“Using the same approach we should be able to produce a large variety of nano-particle dispersions useful in applications ranging from healthcare to catalysis,” added co-investigator Dr. Ashavani Kumar, a postdoctoral research associate at Rice.

The nanoparticle embedded coating can be applied like traditional paints to such surfaces as metal, wood, polymers, glass, and ceramics. The metal nanoparticles show characteristic color but avoid the use of short shelf-life organic pigment paints.

In addition, these coatings exhibited efficient antibacterial activity toward Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus). The antibacterial property is important for hospitals and other public buildings that are prone to bacterial growth, a main cause of infection and disease.

“We have been working on developing various in situ methods for organic soft matter-mediated metal nanoparticle synthesis,” noted Dr. Praveen Kumar Vemula, one of the investigators. “However, to date, the present approach is the smartest as it is devised based on utilization of naturally occurring process.”

Source: City College of New York

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