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Advanced Materials Science Research

Making the Hospital a Safer Place by the Sonochemical Coating of all its Textiles and Medical Devices with Antibacterial Nanoparticles

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Sonochemistry is an excellent technique to coat nanomaterials on various substrates, imparting new properties to the substrates. After a short demonstration of coating NPs on ceramics and stainless steel, I'll present the coating of textiles such as polyester, cotton, and nylon. In all cases a homogeneous coating of NPs was achieved. Lately, the FDA shows less enthusiasm towards nanoAg, as a result, we have moved to NPs of ZnO, and CuO as antibacterial agents. They were coated on the abovementioned fabrics and showed excellent antibacterial properties. The coated textiles were examined for the changes in the mechanical strength of the fabric. A special attention was dedicated to the question whether the NPs are leaching off the fabric when washed repeatedly. The coated CuO NPs on cotton underwent 65 washing cycles at 750C in water in a Hospital washing machine, no NPs were found in the washing solution and the antibacterial behavior was maintained. Recently, an experiment was conducted at PIGOROV Hospital in Sofia, Bulgaria in which one operation room was equipped with antibacterial textiles, namely, bed sheets, pajamas, pillow cover, and bed cover. 22 Patients in this operation room were probed for bacterial infections. Their infection level was compared with 17 control patient that were using regular textiles. The results are demonstrating that a lower infection level is observed for those patient exposed to the antibacterial textiles. In addition medical devices were also coated with the same NPs. The following medical devices were coated with metal oxide Nanoparticles and showed very good biocidal properties and inhibition of biofilm formation 1)Urinal Catheters 2) Contact lens 3) Cochlear electrodes, 4) metallic implants, and 5) silicon implants. In my lecture examples of 1) and 2) will be demonstrated. Coating of Catheters with the above mentioned NPs were performed and the coated catheters were inserted in rabbits. Results showed that the urine of the rabbits was not contaminated with bacteria. Finally, the metal oxide NPs showed excellent properties in eliminating Multi Drug Resistant bacteria.

Biography

Aharon Gedanken obtained his Ph. D. degree from Tel Aviv University, Israel. After his postdoctoral research at USC in Los Angeles. He got a lecturer position at BIU on Oct. 1975. In 1994 he switched his research interest from Spectroscopy to Nanotechnology. His special synthetic methods of nanomaterials include: Sonochemistry, Microwave Superheating, Sonoelectrochemistry, and Reactions under Autogenic Pressure at Elevated Temperatures (RAPET). Since 2004 he is mostly focused on the applications of nanomaterials. Gedanken has published 835 per-reviewed manuscripts in international journals. His H-Index is 91. He was a partner in five EC FP7 projects one of them, SONO, was coordinated by him. This project was announced by the EC as a "Success Story". He was the Israeli representative to the NMP (Nano, Materials, and Processes) committee of EC in FP7. He was awarded the prize of the Israel Vacuum Society in 2009 and the Israel Chemical Society for excellence in Research in Feb.2013.

Publications

- Using sonochemistry for the fabrication of nanomaterials
- Enhanced antibacterial activity of nanocrystalline ZnO due to increased ROS-mediated cell injury
- Sonochemical synthesis and characterization of nanometer-size transition metal oxides from metal acetates
- Synthesis, characterization, and properties of metallic copper nanoparticles
- Shape-controlled synthesis of silver nanoparticles by pulse sonoelectrochemical methods

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