Anti-microbial coatings formed by depositing gas-phase Ag nanoparticles

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Nanotechnology has long promised new types of designer materials with advanced optical, electronic and magnetic properties. Recently, it has been used to develop nanostructured coatings that show strong anti-microbial properties, which are of great interest in the field of medical science.

It has been known for sometime that Ag is highly toxic to a wide range of bacteria, and Ag based compounds have been used extensively in bactericidal applications. This property of Ag has caused great interest especially as new antibiotic resistant pathogens (e.g. MRSA) have become a serious problem in public health.

Recent studies have shown that nanoparticulate Ag acts against gram-negative bacteria in a number of additional ways to bulk Ag, meaning that it is more effective at inhibiting bacterial growth [1]. This is partly due to the small size of the cluster (<10 nm) and also the high surface/volume fraction of atoms contained in the cluster.

We present a study of the anti-microbial properties of Ag nanocluster films formed in a UHV gas aggregation cluster source. Production of clusters in this type of environment ensures their chemical cleanliness and also allows a high degree of control over the size distribution of the resulting clusters, by means of aerodynamic lensing. Contact assays for several common types of bacteria (E.Coli, Salmonella, S.aureus) were performed and for all types of bacteria show at least a 10 fold reduction (over 5 hours) in the number of viable bacteria present on the Ag nanocluster film.

An additional technique is reported that allows the clusters to be deposited into a bio-compatible liquid suspension directly from the vacuum environment.

[1] J.R. Morones et al, *Nanotechnology*, **16** (2005) 2346-2353