Gold and silver nano baubles

EurekAlert

They might just be the smallest Christmas tree decorations ever. Tiny spherical particles of gold and silver that are more than 100 million times smaller than the gold and silver baubles used to decorate seasonal fir trees have been synthesized by researchers in Mexico and the US.

Writing in the December issue of the *International Journal of Nanoparticles*, materials engineer Xavier E. Guerrero-Dib, of the Universidad Autónoma de Nuevo León and colleagues there and at The University of Texas at Austin, describe the formation of gold, silver and alloyed, bimetallic nanoparticles just 25 nanometers in diameter. They used vitamin C, ascorbic acid, commonly found in tangerines, a favorite stocking filler in many parts of the world, and a soap-like, surfactant molecule known as cetyltrimethylammonium bromide, an antiseptic occasionally used in expensive cosmetics.

Reaction of silver nitrate and the gold compound chloroauric acid under these conditions led to successive reduction of the metals and the formation of different silver, gold and bimetallic nanoparticles. The precise structures of the nanoparticles were revealed using a high-resolution elemental mapping technique. The analysis shows the nanoparticles to have multiple layers, shells of gold within silver within gold, in the case of the bimetallic particles and some blending, or alloying, of the metals occurred.

Nanoparticles are of great interest to chemists and materials scientists for their potential as catalysts for speeding up chemical reactions, as novel drug-delivery agents, and as quantum dots for analytical applications. They may also be used in the fabrication of the components of future electronics devices beyond the silicon chip. Metal nanoparticles containing two or more different metals might have even more intriguing chemical, electronic and optical properties than single-metal nanoparticles because of the combination of the different chemistries of each metal as well as the size effects of the particles simply being, very, very small.

The researchers point out that the optical properties of nanoparticles depend very much on size and shape as well as the constituent metals. Gold and silver nanoparticles are particularly useful as their optical effects occur at visible wavelengths of light. The team adds that if it were possible to fine-tune the combination of gold and silver in the same nanoparticles then it might also be possible to tune the optical properties of such particles.

SOURCE [1]

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