Noble metal nanoparticles deposit on the mycelium of growing fungi--an approach to new catalytic systems?

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(PhysOrg.com) -- When fungi, such as penicillium, grow, they form a thread-like network, the mycelium. If the fungus is grown in a medium containing nanoscopic particles of a noble metal, the resulting mycelium is coated with the nanoparticles. As researchers from the Technical University in Dresden and the Max Planck Institute for the Chemical Physics of Solid Materials in Dresden (Germany) report in the journal Angewandte Chemie, such hybrids could be an interesting new approach for the production of catalytic systems.

The team, led by Alexander Eychmüller and Karl-Heinz Pée, cultivated various types of fungus in media with finely divided (colloidal) nanoparticles of noble metals. In the presence of the tiny gold, platinum, or palladium particles, the fungi grew with no appreciable impairment.

Silver particles, which are toxic to microorganisms, were also tolerated by one variety of fungus. The nanoparticles are deposited on the surface of the growing mycelium—without any special modification beforehand. Thus hybrid systems made of fungi and noble metals are formed: tubular hyphae covered in multiple layers of individual nanoparticles.

The optical properties of nanoscopic particles depend on their size. The researchers determined that the optical properties of their deposited particles differ only slightly from those of the nanoparticles in solution. Fungal threads with a 0.2µm gold covering thus appear reddish brown,

like a solution of such gold nanoparticles. This is evidence that the nanoparticles have not aggregated to form larger units.

Because the particles remain separate, the mycelium-bound noble metal nanoparticles should also retain their special catalytic activities. The researchers were thus able to determine that a platinum–fungus hybrid catalyzes the redox reaction of hexacyanoferrate and thiosulfate in aqueous solution. The “enobled” fungal mycelium offers a system easy to separate from the solution after the reaction and a highly specific surface—important for a catalyst.

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