OMICS Group Conferences
Accelerating Scientific Discovery

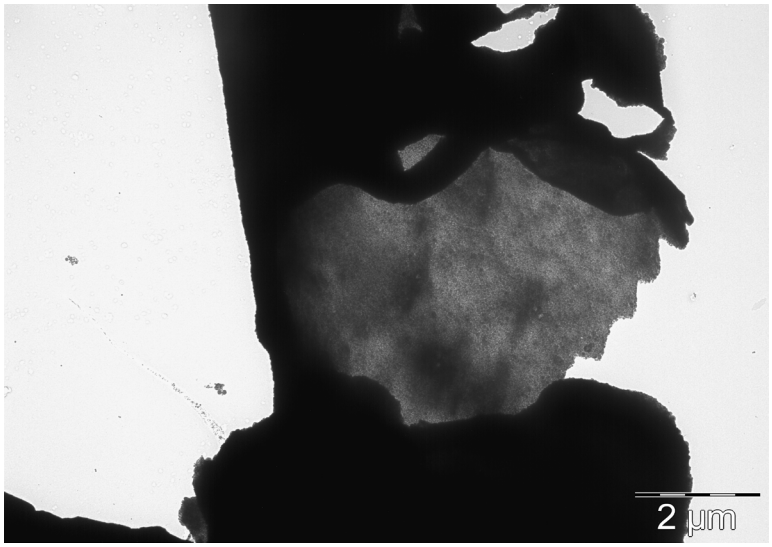
3rd International Conference on
Nanotek & Expo

December 02-04, 2013 Hampton Inn Tropicana, Las Vegas, NV, USA

Modification of photocatalytic nanocomposites by controlled vacuum freeze-drying

Richard Dvorsky
Institute of Physics, VSB-Technical University of Ostrava, Czech Republic

Photoactive ZnS nanoparticles were precipitated by heterogeneous nucleation on the surface of carrying silicon nanoparticles, dispersed in an aqueous solution of zinc acetate with sodium sulphide. The produced photoactive colloidal dispersion was desiccated in two different ways. 1. The dispersion was filtered and the residual water evaporated in the presence of air at 100°C. 2. The aqueous dispersion was very rapidly freezed to -20°C and water molecules sublimated at the required optimal rate in the controlled vacuum. The structure of the composite material (Si)ZnS produced via thermal drying at 100°C is significantly tighter than the structure obtained by vacuum freeze-drying. Controlled freeze-drying enables self-organization of composite nanoparticles into lamellar structures, as shown in Figure 1, with a significantly larger specific surface area than the product of ordinary thermal drying. It thus provides several times higher catalytic efficiency.



The combination of two semiconductor materials of Si (band gap of 1.11 eV) and ZnS (band gap of 3.6 eV) is also promising, in particular enabling adjustment of the spectral dependence of the photocatalytic efficiency of the new composite material.

Biography

Richard Dvorsky obtained the RNDr. degree in Nuclear Physics from the Faculty of Mathematics and Physics of the Charles University in Prague, and the Ph.D. degree in Material Science from the VSB-Technical University of Ostrava. He is an associated professor in field of physics and material science in the Institute of Physics at the VSB-Technical University of Ostrava. He is the author or co-author of 23 papers in peer-reviewed scientific journals and 3 patents. His research focuses on top-down and bottom-up preparation of nanoparticles and functional particle nanocomposites.

richard.dvorsky@vsb.cz