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Preparation and properties of effective photocatalytic nanostructures by application of new patented controlled sublimation

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For practical sorption and degradation of pollutants and hazardous substances, it is possible to advantageously apply new hybrid nanomaterials with a high specific surface area and the photocatalytic efficiency. This work presents the preparation of effective photocatalytic core-shell nanostructures C60-TiO2-C60 by application of a new patented method of controlled sublimation. Nanoparticles of commercial photocatalytic material TiO2 (P25 Evonik) were subjected to cavitation ultrasonic deagglomeration in a liquid dispersion medium of solution of fullerene C60 in toluene. Subsequently, in a strong ultrasonic field a new method for preparing of microemulsion nanoparticle core-shell C60-TiO2-C60 was applied. Their aqueous nanodispersion was solidified by very fast freezing, which prevents the crystalline segregation of the dispersion and preserves homogeneous distribution of nanoparticles in the solid amorphous block. By controlled sublimation at the chosen temperature and pressure molecules of water were removed from the frozen dispersion. Controlling of conditions during sublimation provided suitable speed of the phase interface retreat between ice and vacuum and dispersed nanoparticles were organised under these conditions into lamellar nanoaggregates with high specific surface area. Thus prepared nanomaterial showed during degradation tests a high photocatalytic activity.

Biography

Richard Dvorsky has completed his PhD in Applied Physics and Post-doctoral studies in Nanomaterial Sciences from VSB – Technical University of Ostrava in Czech Republic. He is the Head of Laboratory of Nanoparticulate Materials and Department of Physical Experiments, a member of Czech Physical Society and the Czech Society for New Materials and Technologies. He has published more than 32 papers in reputed journals, chapter in book (Wiley) and is the inventor of several patents in stream of nanotechnology.

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