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On the use of nanodiamonds for photocatalytic applications

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TiO_2 nanostructured and architecturized materials are widely used and studied for photocatalysis and photoconversion purposes for water and air treatment, surface fonctionalization and solar cells applications. Nanodiamonds (NDs) are carbon particles with sizes from two to few tens of nanometers. Research in the area of NDs has been traditionally centered on their mechanical reinforcement properties. However, the combination of an inert and insulating sp3 core with a functionalizable and active surface that can host a variety of functionalized moieties also makes NDs an incomparable candidate for other kind of applications. Despite low conductivity, NDs films have been recently considered as an appropriate electrode material for photovoltaic cells. We report on an innovative and pioneer study related on the synthesis and application of composites based on nanodiamonds associated to TiO_2 nanoparticles both for energy and environment purposes: Photocatalytic dissociation of water (water-splitting) for H_2 production and photo-oxydation of air pollutants were studied. NDs with different surface species and properties and different contents were characterized and tested as composite photocatalysts. These composites exhibited higher photocatalytic activity than the respective bare materials. The study also focused on the NDs-TiO_2 interface and interaction at the nanoscale.

Biography

Valérie Keller is a senior scientist at ICPEES (Institute of Chemistry and Processes for Energy, Environment and Health) in Strasbourg. She received her PhD degree in Chemistry and Catalysis from the University Louis Pasteur of Strasbourg in 1993. In 1996 she returned to Strasbourg and was appointed as researcher in CNRS, where she is now responsible of the Team "Photocatalysis and Photoconversion". In 2012 she was promoted as Director of Research. Her main research activities concern photocatalysis for environmental, energy and health applications, and the synthesis and characterization of nanomaterials for photoconversion purposes. She is the author of over 95 publications in peer-reviewed journals and more than 50 communications in international conferences and symposium. She is also the author of 15 patents. In 2013 she was awarded the 1st Price of the Strategic Reflection (awarded by the French Home Secretary).

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