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Composite nanostructures for VIS-active photocatalysts

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Photo-catalysis is a process that makes possible solving some critical environmental issues, as the pollutants removal at (very) low concentrations from waters or air. The first photo-catalyst and one of the most efficient is TiO_2 (the anatase polymorph) that is largely used and reported. However, anatase has one major drawback that limits its up-scaling which is activated only by UV radiation, thus photo-catalysis runs only under this type of radiation. Vis-active photo-catalysts are therefore very much searched and are developed based on several principles as, e.g. novel type of semiconductors, aqueous stable (which, so far, are not too many) or composite structures of TiO_2 with p-type semiconductors, resembling the structure of an inverted photovoltaic cell, as CuInS_2 (CIS) or $\text{Cu}_2\text{ZnSnS}_4$ (CZTS) efficient in Vis radiation harvesting and stable in water. Composite structures are reported also considering the TiO_2 or ZnO matrix infiltrated with graphene, graphene oxide or reduced graphene oxide. The photo-catalytic material can be used as dispersed powder (in wastewater for advanced treatment) but this has the disadvantage of light scattering and the more complex treatment process involving the separation step of the (nanosized) powder, therefore, thin films of photo-catalytic materials are recommended. The properties of the thin photo-catalytic films obtained by Spray Pyrolysis Deposition (SPD) are presented and discussed in terms of process overall efficiency and efficiency of the key steps such as pollutants' adsorption and pollutants photo-degradation through oxidation up to mineralization with a focus on the influence of the crystallinity of the composite structure.

Biography

Anca DUTA has completed her PhD in Chemical Engineering in 1996 from the Polytechnica University of Bucharest, Romania. She is the Leader of the Advanced Materials for Energy and Environment group in the R&D Centre Renewable Energy Systems and Recycling in the Transylvania University of Brasov, Romania. She has published more than 150 papers out of which 122 papers in ISI journals and has been serving as an Editorial Board Member of repute.

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