Physico-Chemical Nanomaterials Science

Nanostructured Materials for Wastewater Treatment

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Water scarcity and wastewater contamination by dyes, heavy metals (such Hg, Cd, As, Pb) and bacteria due to industrialization, urbanization and population growth represents major and serious concerns. Meanwhile, the continuous deterioration of water quality and the fast grow demand for clean water become real challenges nowadays.

In this context, Nanotechnology has been identified as great potential for advancing novel technologies in water and wastewater treatments. It is known that materials at the nanoscale exhibit unique and enhanced properties including high surface area, surface active sites, quantum confinement, and surface plasmon resonance (SPR) effect.

In this paper, various nanostructured materials (thin films and powders) were synthesized and in-depth characterized in terms of structure, morphology, chemical composition, surface area and surface state, optical and magnetic properties by using advanced analytical techniques including XRD, TG/DSC, SEM, TEM/SAD, EDS, AFM, BET, UV-vis and PL, XPS, etc. Particular interest will be devoted to (i) photo-degradation of dyes using TiO_2/ZnO thin films; (ii) heavy metal removal (adsorption) from aqueous solution using magnetic nanoparticles (spinel ferrites); and (iii) interaction of some selected nanoparticles (TiO_2, ZnO, AgNPs, Graphene Oxide) with aquatic species.