NANOCRYSTALLINE IRON (III) OXIDES: SOLID-STATE SYNTHESIS AND APPLICATIONS IN CATALYSIS, PHOTOCATALYSIS AND FUNCTIONAL MAGNETIC MATERIALS

MACHALA Libor, ZBOŘIL Radek, TUČEK Jiří, FRYDRYCH Jiří & PRUCEK Robert

Palacky University, RCATM, Olomouc, Czech Republic, EU

Abstract

High chemical and thermal stability, interesting electric and magnetic properties, high sorption capacity and cost effective production predetermine nanostructured iron(III) oxides for their wide applications in various areas including heterogeneous catalysis, photocatalysis, biomedicine, or fabrication of functional magnetic materials. Thermally induced solid-state reactions constitute simple and cost-effective way how to synthesize ferric oxide nanostructures with a possibility to control their properties. Thus, ferric oxide nanopowder has been prepared by a thermal decomposition of ferrous oxalate dihydrate in air and tested as a catalyst in the decomposition of hydrogen peroxide and phenol degradation. Despite of a lower specific surface area, a nanocrystalline iron(III) oxides exhibited a higher catalytic efficiency contrary to amorphous iron(III) oxide. Sn-doped nanostructured -Fe2O3 thin layers prepared by a thermally induced decomposition of ferric chloride hexahydrate in a presence of a doping agent have been found to be photocatalytically active as a semitransparent photoelectrode for water splitting. Apart from -Fe2O3, -Fe2O3 currently deserves a significant attention due to a large room-temperature coercive field, magnetoelectric coupling and ferromagnetic resonance it exhibits. In case of its synthesis in high yields and without any other Fe2O3 polymorphs as admixtures, it would become as a perspective candidate for applications based on high coercivity materials and/or requiring coupled electric and magnetic material characteristics and/or involving the absorption of electromagnetic waves with wavelengths on the order of units of millimeters.

Author did not supply full text of the paper/poster