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Nanostructured lithium oxide-hematite magnetic oxide semiconductors[1] MONICA SORESCU, VASILII BUSHUNOW, Duquesne University, LUCIAN DIAMANDESCU, FELICIA TOLEA, MIHAELA VALEANU, National Institute of Materials Physics Bucharest, TIANHONG XU, Duquesne University — The study aims at exploring the formation of magnetic oxide semiconductors at the nanoscale, which is of crucial importance for catalysis, sensing and electrochemical applications. xLi2O-(1-x)alpha-Fe2O3(x = 0.1, 0.3, 0.5, and 0.7) nanoparticle systems were successfully synthesized by mechanochemical activation of Li2O and alpha-Fe2O3 mixtures for 0-12 hours of ball milling time. X-ray powder diffraction (XRD), Mossbauer spectroscopy and magnetic measurements were used to study the phase evolution. Rietveld refinement of the XRD patterns yielded the values of the particle size as function of composition and milling times. The Mossbauer studies showed that the spectrum of the mechanochemically activated composites evolved from a sextet for hematite to sextets and a doublet upon duration of the milling process with lithium oxide. Magnetic measurements recorded at 5 K to room temperature (RT) in an applied magnetic field of 50,000 Oe showed that the magnetization of the milled samples is larger at low temperatures than at RT and increases with decreasing particle size. Zero field cooling measurements made possible the determination of the blocking temperatures of the specimens as function of ball milling time and evidenced the occurrence of superparamagnetism in the studied samples.

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