Synthesis and Properties of Magnetic Ceramic Nanoparticles

Tianhong Xu and Monica Sorescu (PI), Duquesne University, DMR 0854794

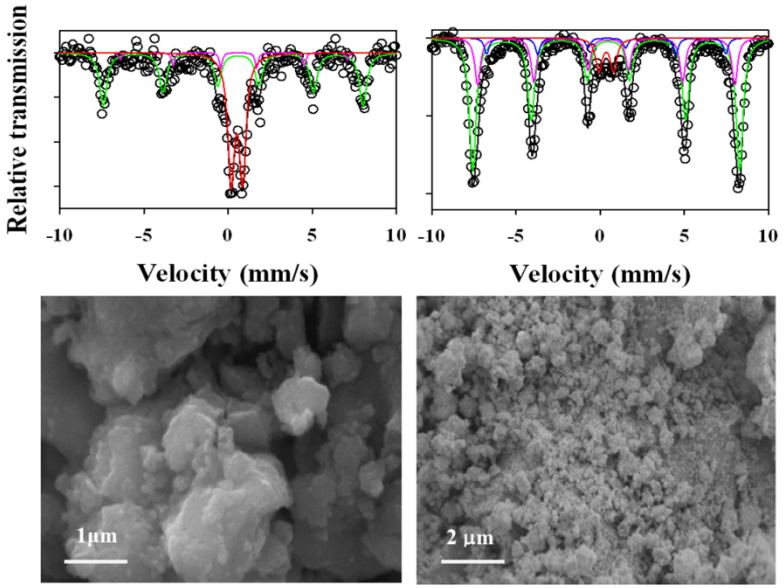
Hematite is one of the most used oxides with various applications in scientific and industrial fields.

We demonstrated that hematite doped with transition metal oxides through high energy ball-milling method possesses interesting physical and chemical properties. The as-formed solid solutions can be ferromagnetic, ferrimagnetic and paramagentic materials, depending on the doping percentage of transition metal oxides or the formation of new materials due to solid state reaction. The thermal behavior of hematite was altered due to the solid-solid interaction and ion substitutions. The magnetic phase evolutions were monitored through XRD, Mössbauer spectroscopy, SEM, DSC-TGA, and UV-Vis. The band gap of hematite can be tuned through controlling the duration of ball-milling time. This is critical for the application of Fe_2O_3 in water splitting catalyst, semiconductor, gas sensor and magnetic ceramic materials.

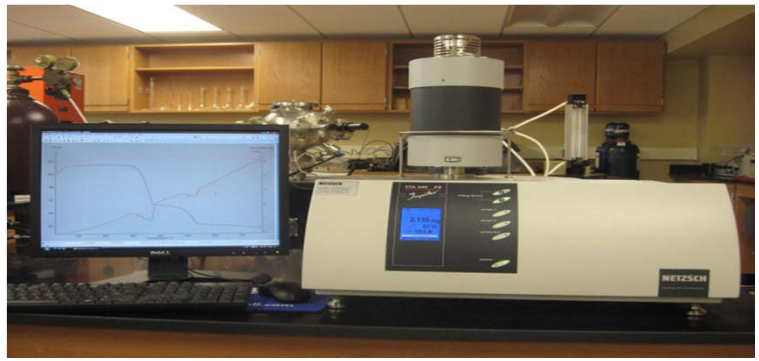
[1] Monica Sorescu, Tianhong Xu, Lucian Diamandescu, ***Mater. Character.*** 61 (2010) 1103-1118

[2] Monica Sorescu, Tianhong Xu, Lucian Diamandescu, ***J. Mater. Sci.*** 46 (2011) 2350-2358

[3] Monica Sorescu, Tianhong Xu, Johanna Burnett, Jennifer Aitken, ***J. Mater. Sci***. 2011 (Accepted).



Mössbauer spectra and SEM images of In_2O_3-Fe_2O_3 solid solution (left) and as-synthesized $LaFeO_3$ perovskite (right) after 12 h milling



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