

MÖSSBAUER STUDIES OF MAGNETIC Fe₂O₃/SiO₂ NANOCOMPOSITE

Adriana Lančok¹, Karel Závěta¹, Cecilia Savii²

¹ Laboratory of Mössbauer Spectroscopy, MFF UK, V Holešovičkách 8, 180 00 Prague, Czech Republic

² Institute of Chemistry Timisoara of Romanian Academy, 24 Mihai Viteazul Blvd., RO-300223, Romania

Fe₂O₃/SiO₂ magnetic nanocomposites rich in Fe₂O₃ have been obtained by annealing at 1000°C the xerogel samples, prepared under various conditions. The target concentrations of iron oxide in inert matrix were 20% and 30%. As mesoporous matrices both silica and polyvinyl alcohol - silica hybrid ones were used. The xerogel nanocomposite samples were obtained in situ and by impregnation under ultrasonic activation. All obtained samples were annealed under moderate oxidation conditions (air) and inert atmosphere such as vacuum or nitrogen.

Mössbauer spectra were obtained using a conventional Mössbauer spectrometer with a ⁵⁷Co/Rh source and constant acceleration. Velocity calibration was done using α-iron, and the Mössbauer parameters are given relative to this standard at room temperature. The Mössbauer spectra contained the sextets of ε-Fe₂O₃, hematite, and superparamagnetic component. The content of various phases in the samples depends on the conditions of preparation. In one of the samples also magnetite was present. The ranges of the ε-Fe₂O₃ area of the samples are 39-76%. The hematite phase is only residual, after transformation due to heat treatment.