

Abstract:

In this work a preparation and characterization of nanoparticles of iron(III) oxide substituted with scandium in SiO_2 matrix is described. The nanoparticles were prepared by the sol-gel method yielding mostly $\beta\text{-Fe}_2\text{O}_3$ substituted with various amount of scandium(III) ions.

Mossbauer spectroscopy was carried out to determine purity of the samples and the content of other iron oxides phases. System was characterized by magnetic measurements. Powder X - ray diffraction was used to verify the composition and to determine the lattice parameter and particle size.

$\beta\text{-Fe}_2\text{O}_3$ is formed at the temperatures of 1000 and 1100 °C at composition $\text{Fe}_{2-x}\text{Sc}_x\text{O}_3$ for $x \geq 0.2$ and at temperature 1100 °C for $x = 0.1$. Lattice parameter is linearly dependent on the scandium content and depends also on the annealing temperature. At temperatures higher than 1250 °C, $\beta\text{-Fe}_2\text{O}_3$ is transformed into hematite.

Key words: iron(III) oxide, scandium, sol-gel, Mossbauer spectroscopy, X-ray diffraction, magnetic measurements