Fe_3C-BASED NANOPOWDER STUDIED BY MÖSSBAUER SPECTROSCOPY

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The Fe_3C-based nanocrystalline composite was prepared by the laser pyrolysis method, using a cross-flow reactor in which the laser orthogonally irradiates the gas mixture of $Fe(CO)_5$ and C_2H_4. Vapours of iron pentacarbonyl served as a source of Fe atoms. Ethylene absorbed CO_2 laser radiation but was also a source of C atoms (after its decompositon on hot surfaces of freshly formed Fe particles). The synthesized nanopowder was in-situ passivated with air.

The as-synthesized powder was characterized by HRTEM, XRD, Mössbauer spectroscopy, and low temperature magnetic measurements. The nanopowder consisted of aggregated nanoparticles (around 20 nm large) having carbonaceous shells.

In our contribution we present the results of the above mentioned characterizational techniques. We concentrate especially on the interpretation of the Mössbauer spectra measured at high temperatures (up to 300 °C) and low temperatures (down to 4 K).