MÖSSBAUER SPECTROSCOPY OF Fe-BASED NANOPOWDERS SYNTHESISED BY MICROWAVE PLASMA TORCH

B. David[1], N. Pizúrová[1], V. Kurdrle[2], O. Jašek[2], P. Synek[2]

[1]Institute of Physics of Materials, ASCR, v.v.i., Brno, Czech Republic

[2]Faculty of Science, Masaryk Univeristy, Brno, Czech Republic

Microwave plasma torch at atmospheric pressure was used for the synthesis of Fe-based nanoparticles [1]**.** The discharge was ignited in argon which flowed through the central gas flow channel whereas the reactive mixture of H_2/O_2 gas and $Fe(CO)_5$ vapour was added by a concentric opening of the outer channel. The morphology and composition of the synthesised nanopowders were studied by TEM, XRD, Raman spectroscopy and Mössbauer spectroscopy.

Only γ-Fe_2O_3 (d_{XRD} = 20 nm) phase was identified by XRD in the **T89** sample. However the Fe_3O_4 characteristic peaks (669 cm^{-1}, 349 cm^{-1}) were also observed in the Raman spectrum.

γ-Fe_2O_3 (d_{XRD} = 18 nm, 41 wt.%), ε-Fe_2O_3 (d_{XRD} = 27 nm, 28 wt.%), and α-Fe_2O_3 (d_{XRD} = 39 nm, 31 wt.%) phases were identified in the XRD pattern of the **T104** sample. In its Raman spectrum the characteristic bands of α-Fe_2O_3 were observed besides the week bands of γ-Fe_2O_3 and Fe_3O_4. The bands of ε-Fe_2O_3 were overlapped with the bands of α-Fe_2O_3, Fe_3O_4, and γ-Fe_2O_3.

In the **T107** sample α-Fe (d_{XRD} = 48 nm, 51 wt.%) and Fe_3O_4 (d_{XRD} = 10 nm, 49 wt.%) phases were found by XRD. The presence of Fe_3O_4 was clearly confirmed by Raman spectroscopy.

[1] L. Zajíčková, P. Eliáš, M., Jašek, O. et al. Plasma Phys. Control. Fusion 47 (2005) B655-B666

Presenting author: **Bohumil David**

Address: **Žižkova 22, 61662 Brno, Czech Republic**

FAX: **+420 541 218 657**

E-mail: **david@ipm.cz**