

SYNTHESIS AND CHARACTERIZATION OF NANOPARTICLES Fe⁰/PVP

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Nanoparticles are being used for diverse purposes: medical treatments, various branches of industry production such as solar and oxide fuel batteries for energy storage, wide incorporation into diverse materials of everyday use such as cosmetics or clothes, optical devices, catalytic, bactericidal, electronic, sensor technology, biological labeling [1]. We studied the effect of polymer as encapsulating agent on synthesis. (Fe⁰) nanoparticles were prepared by chemical reduction from ferric salt-solution in the presence of PVP used as a stabilizer. Encapsulated nanoparticles Fe⁰-PVP were prepared according to the method of chemical co-precipitation in the presence of poly-N-vinylpyrrolidone (PVP) (MW: 3000). The presence of PVP gives possibility of formation encapsulated nanoparticles proved by FT-IR spectroscopy shown in (Fig.1(a)).

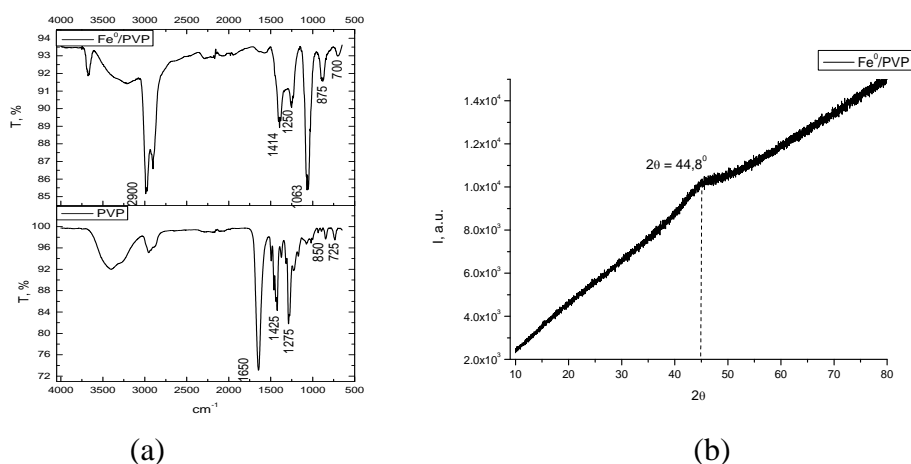


Fig. 1: (a) IR spectra of Fe⁰/ PVP nanoparticles and PVP; (b) XRD of Fe⁰/ PVP nanoparticles

The resulting nanoparticles were characterized by X-ray powder diffraction (XRD) analysis, X-ray fluorescence analysis (XRF), scanning electron microscopy (SEM) FT-IR-spectroscopy.

The diffractogram of the Fe⁰/PVP nanoparticles, with the maximum diffraction at $2\theta = 44.8^\circ$. Particles size was computed according to Debye-Scherrer formula, which corresponds to 4 nm (Fig.1 (b)). This result displays the presence of Fe⁰.

The X-Ray Fluorescence Spectroscopy (XRF) of encapsulated nano-sized iron (~ 4.7 nm) showed that the transition energy corresponding to the gravity centre of the FeK- α_1 line shifts by 1.33 eV as a result of a transition from a flat polycrystalline sample to nanoscale iron [1].

References:

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[2.] Я.С. Уманский, Ю.А. Скаков, А.Н. Иванов, Л.Н. Расторгуев. Кристаллография, рентгенография и электронная микроскопия. М.: Металлургия, 1982, 632с.