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## Synthesis and characterization of iron oxide nanoparticles using electrical discharge in solution

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### Abstract

Iron oxide nanoparticles were synthesized for the first time using electrical arc discharge between a pair of highly pure titanium electrode without using metallic iron electrodes in iron chloride salt solution. The produced nanoparticles were characterized using various analyses such as X-ray Diffraction (XRD) and X-ray Photoelectron Spectroscopy (XPS). XRD and XPS analyses showed formation of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> phase. Microscopic studies on the obtained samples revealed formation of rice like iron oxide nanostructures at 10 minutes of electrical discharge which changed to semi-spherical shape after calcination at 600 °C for 2 hours. The results of Dynamic Light Scattering (DLS) analysis demonstrated formation of 24 nm particles with almost narrow distribution of 11nm, which are increased in size and distribution width by heat treatment. The obtained results verify the potential ability of this technique to achieve monodispersed iron oxide nanoparticles with narrow distribution in a very short time.

**Keywords:** nanoparticles, iron oxide, electrical discharge, solution

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