Synthesis of Magnetite/ Hematite/ Iron Nanocomposites by the Low Voltage Arc Discharge in Water in the Presence of External Magnetic Field

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A new method for the synthesis of magnetite/ hematite/ iron nanocomposites (MHINC) is introduced. In this method, a low-voltage arc is discharged between two iron electrodes in distilled water while an external magnetic field with the nominal power of 0.4-1.6 T is applied during synthesis. The measured magnetic field exactly on the anode tip is 80 to 210 mT. By arc discharge, iron is oxidized to iron oxides. The synthesized samples are characterized by SEM, TEM, XRD and VSM techniques. The sizes distributions of some samples are identified by dynamic light scattering (DLS) test. The obtained results show the presence of the external magnetic field can decrease the particle sizes and also increases the saturation of magnetization and the transformation rate of iron into iron oxide in nanocomposite.

Keywords: External magnetic field; Arc discharge; Nanocomposite; Iron; Magnetite; Hematite

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