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Hydrothermal synthesis in egg white solution and magnetic properties of magnetite (Fe_3O_4) nanoparticles

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The magnetite Fe_3O_4 nanoparticles have been synthesized successfully by hydrothermal method in the egg white solution. The egg white solution was used as a surfactant and it can also reduce impurity phase in samples. This work aims to study the influence of different reaction temperatures (160-220 ^oC) on the structure and magnetic properties of the synthesized Fe_3O_4 nanoparticles. The results of X-ray diffraction (XRD) and selected area electron diffraction (SAED) indicate that the synthesized Fe_3O_4 nanoparticles have the inverse cubic spinel structure without the presence of any other phase. The particle sizes of samples are in the range of ~10–50 nm as revealed by transmission electron microscopy (TEM). X-ray absorption near edge structure (XANES) spectra show the oxidation state of Fe^{3+} and Fe^{2+} in the samples. The hysteresis loops of the Fe_3O_4 nanoparticles exhibit superparamagnetic behavior at room temperature for all conditions. The saturation magnetization increases with increasing reaction temperature except at 220 ^oC.

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