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EFFECT OF SYNTHETIC CONDITIONS ON THE TEXTURAL PROPERTIES OF GLUCONIC ACID COATED MAGNETIC IRON OXIDE NANOPARTICLES

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Applications of magnetic iron oxide-based nanomaterials are desirable for removal of heavy metals and other contaminants from waste water because of their important features such as small particle size, high surface area, saturated magnetism, definite pore size and pore volume. This study tends to evaluate the effect of synthetic conditions such as temperature, volume and concentration of precursors on the textural properties of gluconic acid coated magnetic iron oxide nanoparticles. Iron III salt and glucose were used as precursors to prepare the nanomaterials and were characterized using Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray powder diffractometry (XRD) and thermal gravimetric analysis (TGA). The magnetic properties of the as-synthesized materials were measured using the SQUID magnetometer. Textural properties including surface areas, average pore size and pore size distribution of the studied samples were determined by the Brunauer–Emmett–Teller (BET) method. Results showed that the synthesized samples are paramagnetic and superparamagnetic in behaviour. In addition, the mean pore size of the synthesized samples varies between 3.33 and 7.59 nm. This shows that the nanomaterials are mesoporous in nature and contain large plate-like particles with slit-shaped pores which favour adsorption of waste materials from contaminated water. Surface area of the nanomaterials ranged between 158 and 353.80 m^2/g which are far higher than values of the standard magnetic iron oxides reported in literature. The as-synthesized magnetic iron oxide nanomaterials in this study are considered as good candidates for applications such as adsorbents for removal of heavy metals and other organic pollutants from waste waters, photo-electrochemical cells, catalysts and sensors.

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