Preparation and characterization of magnetic Chitosan/Fe3O4 Nanocomposite particles

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ABSTRACT

There were two studies in this research. The first one included the preparation of magnetic chitosan/iron (II, III) oxide composite nanoparticles by a spray-drying method. Field emission scanning electron microscopy (FESEM) micrographs indicate that nanoparticles so prepared have a good sphericity and a rough surface morphology. The average diameters of samples are in range of 200 to 400 nm. Superconducting quantum interference device (SQUID) results indicate that all samples manifest zero coercivity and zero remanence, which infers that each of the samples has a superparamagnetic property. The highest saturation magnetization of samples is about 27.91 emu/g. Dynamic light scattering (DLS) data shows that the zeta potential of samples is higher than 40 mV, indicating that the samples can steadily distribute in water. The second part included the preparation and separation of magnetic chitosan/iron (II, III) oxide micro/nano- particles. In this study, a two-fluid atomizer and spray-drying method was used to prepare magnetic chitosan/iron (II, III) oxide micro/nano- particles. Samples were collected by cyclone collector, multi-stage electromagnet collector, and electrostatic precipitator (ESP), separately. In the multi-stage electromagnet collector, the higher the number of turns (500, 1000, and 1500 turns) in a coil on an electromagnet collector, the higher the strength of electromagnet (200, 250, and 300 G) was found, which was used to collect different size of magnetic micro/nano- particles. Scanning electron microscopy (SEM) micrographs indicate that particles collected by cyclone collector have average diameters in range of 1200 to 5000 nm. Particles collected by multi-stage electromagnet collector have average diameters in range of 300 to 2200 nm. The particles size decreased with increasing the strength of electromagnet. The smallest particles which have diameters in range of 200 to 600 nm were collected by ESP.

Keywords : Chitosan、Spray drying、Iron oxide

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