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Thanh Quang Bui, Suong Nu-Cam Ton, Anh Trong Duong, Hoa Thai Tran

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Dependence of magnetic responsiveness on particle size of magnetite nanoparticles synthesised by co-precipitation method and solvothermal method

AUTHOR

Thanh Quang Bui*, Suong Nu-Cam Ton, Anh Trong Duong, Hoa Thai Tran

Department of Chemistry, College of Sciences, Hue University

ABSTRACT

In the present paper, the dependence of magnetic responsiveness on magnetite nanoparticle size has been studied. 10 nm mono-sized distribution of magnetite nanoparticles were prepared by an ultrasonically enhanced co-precipitation procedure; Carboxyl-functionalised solvothermal approach accorded to synthesise mono-sized-distributed magnetite nanoparticles with the average size of 30 nm. The particle sizes and their distribution have been determined and demonstrated by analysing characteristic data and suggested formation mechanisms of the nanoparticles. The derivation from magnetic characterisation revealed an inverse dependence between the magnetite nanoparticle size and its ability to respond to external magnetic fields, explained by the decrease of magnetic dipoles inside the tailing-away crystalline size of the magnetite nanoparticles. Negligible hysteresis value of 10 nm magnetite nanoparticles is 5 Oe, while the higher magnetic reluctance of 30 nm magnetite nanoparticles is revealed by 80 Oe of coercivity.

KEYWORDS

Fe_3O_4, magnetite nano particles, co-precipitation, solvothermal, magnetic responsiveness-particle size relationship

CORRESPONDING AUTHOR

Email: thanh.qt.bui@gmail.com or thanh.qt.bui@husc.edu.vn

Tel: +84989161651

Address: 77 Nguyen Hue, Hue, Vietnam