

## Impregnation of $\text{Fe}_3\text{O}_4$ Nanoparticles into Mesoporous Materials via $-\text{COOH}$ Groups

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Mesoporous silica with carboxylic groups ( $-\text{COOH}$ ) was prepared by grafting method, using 4-(triethoxysilyl)butyronitrile as the organosilane agent, then treating the sample with sulfuric acid, which removes the template and simultaneously hydrolyses the  $-\text{CN}$  to  $-\text{COOH}$  groups, confirmed by IR spectroscopy. Magnetic nanoparticles of  $\sim 7$  nm have been impregnated into mesoporous silica. Nanoparticles are coupled with  $-\text{COOH}$  groups by exchange reaction. To accomplish this, procedure, consisting of (1) synthesis of mesoporous, (2) grafting and hydrolyzing of organosilane, (3) preparation of nanoparticles covered by oleic acid, and finally, (4) impregnating nanoparticles into the mesoporous materials via exchange reaction between oleic acid and  $-\text{COOH}$  groups of the organosilane. The sample has been characterized by TEM, XRD and BET analysis. The iron content in the sample and magnetic properties were studied using ICP and magnetometer respectively.