

**Kinetics of (3-Aminopropyl)triethoxysilane (APTES) Silanization of  
Superparamagnetic Iron Oxide Nanoparticles**

*Yue Liu,<sup>1</sup> Yueming Li,<sup>2</sup> Xue-Mei Li,<sup>1\*</sup> Tao He<sup>1\*</sup>*

<sup>1</sup>Shanghai Advanced Research Institute, Chinese Academy of Sciences, Shanghai, China

201210

<sup>2</sup>State Key Laboratory of Metastable Materials Science and Technology, College of

Materials Science and Engineering, Yanshan University, Qinhuangdao 066004,

China

Email: [lixm@sari.ac.cn](mailto:lixm@sari.ac.cn); [het@sari.ac.cn](mailto:het@sari.ac.cn)

Kinetics study of APTES silanization

Correspondence should be addressed to Dr. Xue-Mei Li, Email: [lixm@sari.ac.cn](mailto:lixm@sari.ac.cn), tel: +86-21-20350881, fax: +86-21-20325112. Dr. Tao He, Email: [het@sari.ac.cn](mailto:het@sari.ac.cn), tel: +86-21-20325162.

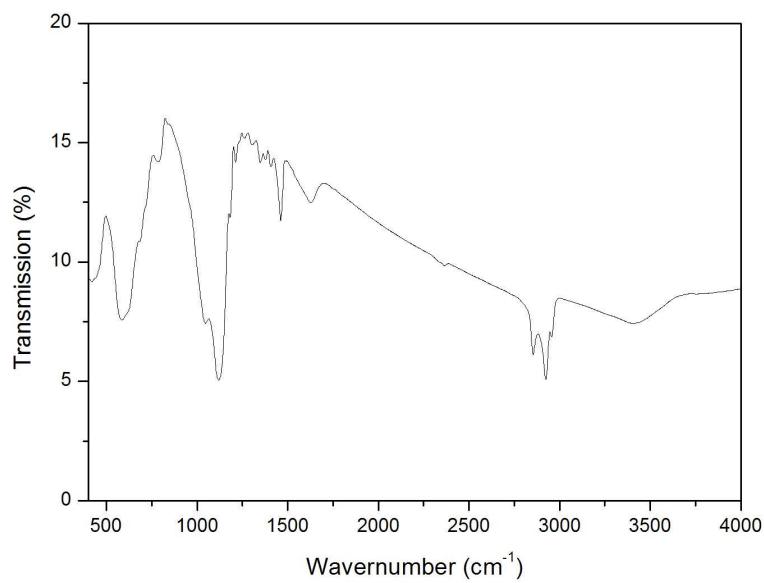


Figure S1. IR spectrum of MNP-NH<sub>2</sub> with absorption peaks at 580 cm<sup>-1</sup> (Fe-O), 1060 (Si-O), 1620 cm<sup>-1</sup> (NH in plane stretching), 2928 cm<sup>-1</sup> (CH<sub>2</sub> asymmetric stretching), and 3420 cm<sup>-1</sup> (NH<sub>2</sub>).

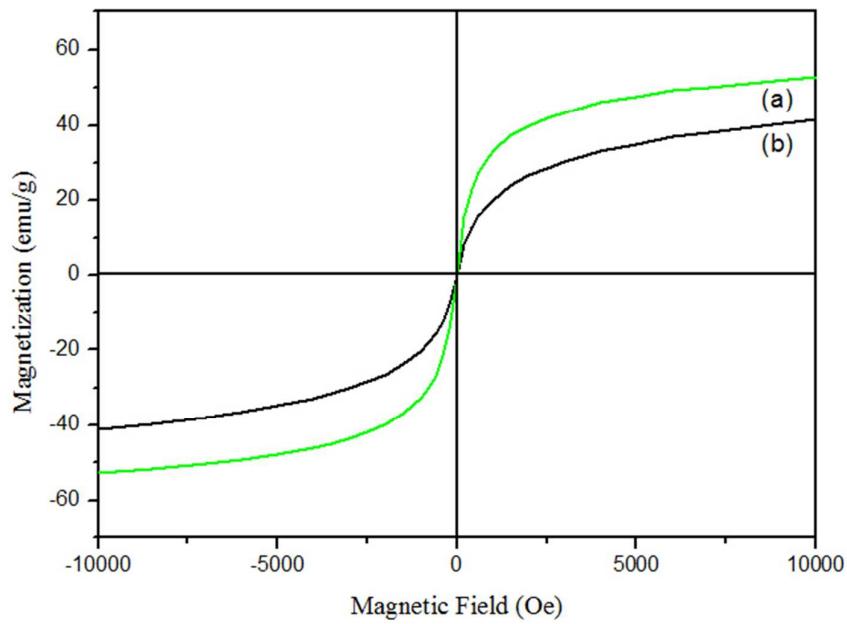
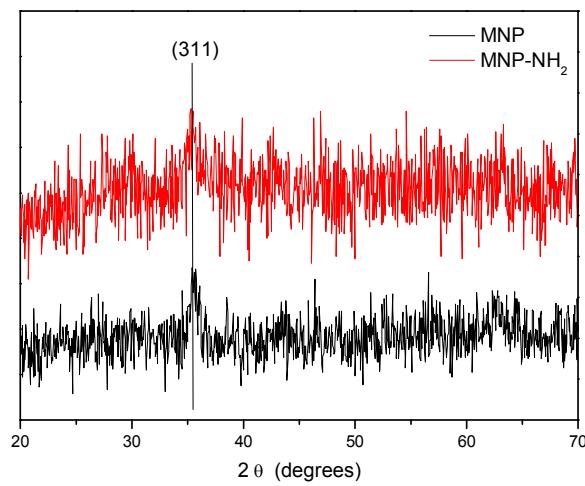
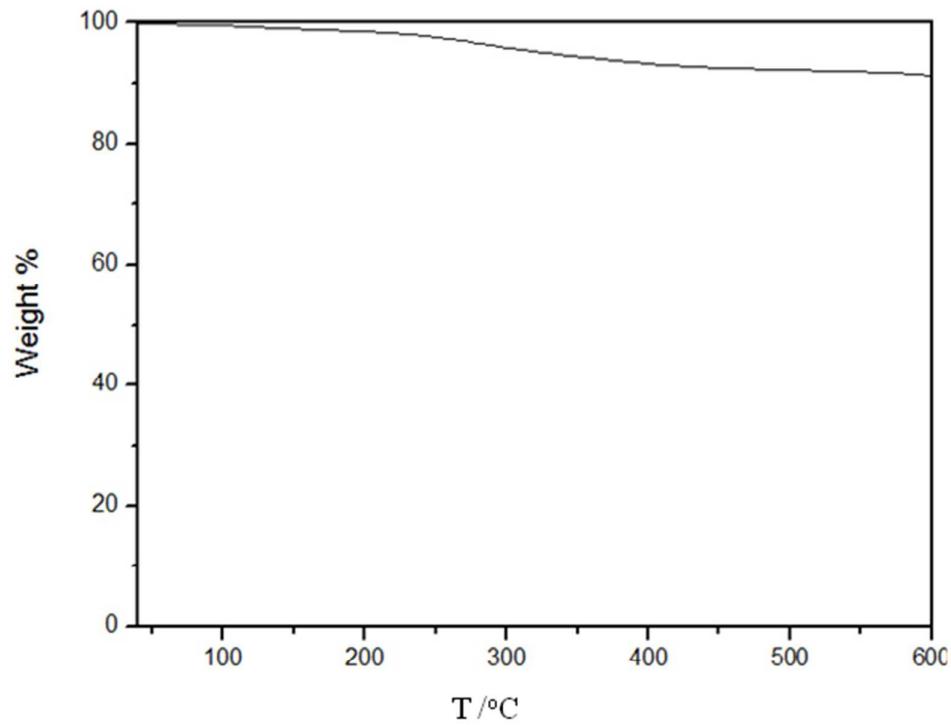


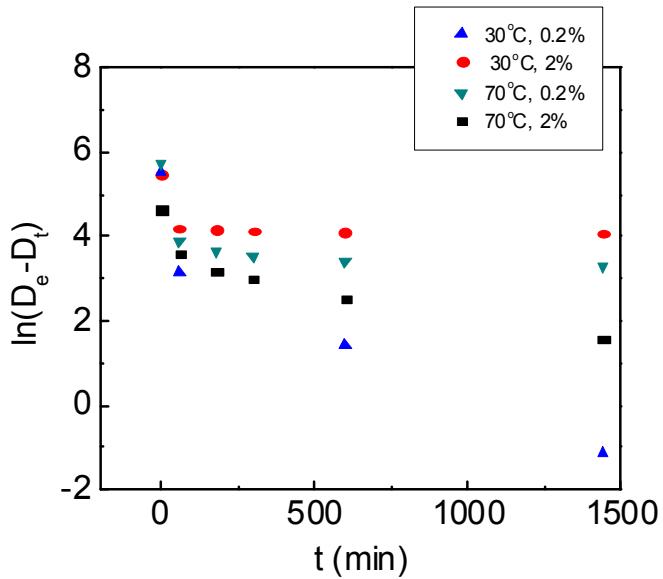
Figure S2. Magnetization properties of bare MNP(a) and APTES modified MNP(b)



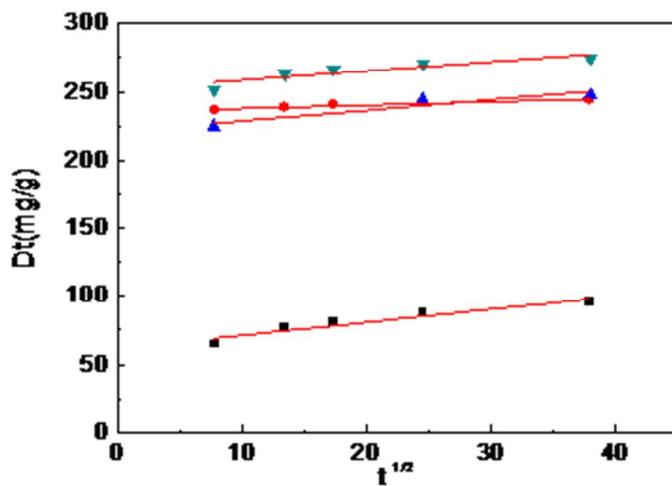
**Figure S3.** X-ray diffraction patterns of MNP and MNP-NH<sub>2</sub>. The peak position at  $2\theta$  of 35.8 degrees corresponds to the (311) lattice peak of Fe<sub>3</sub>O<sub>4</sub> crystals confirming the composition of the MNP is Fe<sub>3</sub>O<sub>4</sub>.



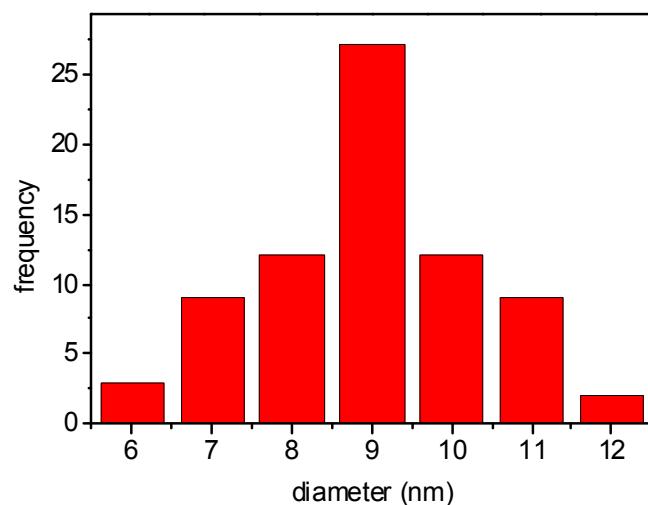
**Figure S4.** The TGA weight change profile of MNP-NH<sub>2</sub> nanoparticles



**Figure S5.** The kinetics of MNP nanoparticles coated with APTES using water as the solvent as fitted by Lagergren pseudo-first model. No linear relationship was found between the  $\ln(D_e - D_t)$  with reaction time.



**Figure S6.** The kinetics of MNP nanoparticles silanization with APTES using water as the solvent as fitted by intra-particle diffusion model



**Figure S7.** Histogram of magnetic nanoparticles (MNP) based on TEM image analysis