Seeded Growth of Ferrite Nanoparticles from Mn oxides: Observation of Anomalies in Magnetic Transitions

Hyon-Min Song,*abc Jeffrey I. Zinkb and Niveen M. Khashabc

d Department of Chemistry, Dong-A University, Busan 604-714, South Korea. E-mail: hyonmin1@dau.ac.kr
b Department of Chemistry and Biochemistry, University of California, Los Angeles, California 90095-1569, United States.
c Division of Physical Sciences and Engineering, and Center for Advance Membranes and Porous Materials (AMPM), 4700 King Abdullah University of Science and Technology, Thuwal 23955-6900, Kingdom of Saudi Arabia.

Fig. S1 TEM images and size distribution of manganese oxide seed NPs.
Fig. S2 XRD of manganese oxide seed NPs.
Fig. S3 TEM images of Fe$_3$O$_4$ NPs grown from manganese oxide seeds.
Fig. S4 HRTEM images of Fe₃O₄ NPs grown from manganese oxide seeds.
Fig. S5 Size distribution of Fe$_3$O$_4$ NPs grown from manganese oxide NPs.

average = 14.5 nm
standard deviation = 1.8 nm
Fig. S6 TEM images of MnFe$_2$O$_4$ NPs grown from manganese oxide NPs.
Fig. S7 HRTEM images of MnFe$_2$O$_4$ NPs grown from manganese oxide NPs.
Fig. S8 STEM images of MnFe$_2$O$_4$ NPs grown from Mn oxide NPs.
Fig. S9 Size distribution of MnFe₂O₄ NPs grown from Mn oxide NPs.

average = 13.2 nm
standard deviation = 2.7 nm
Fig. S10 TEM images of MnFe$_2$O$_4$@Mn$_x$Fe$_{2-x}$O core-shell NPs.
Fig. S11 STEM images of MnFe$_2$O$_4$@Mn$_x$Fe$_{1-x}$O core-shell NPs.
Fig. S12 Size distribution of MnFe$_2$O$_4$@Mn$_x$Fe$_{1-x}$O core-shell NPs.

average = 39.2 nm
standard deviation = 9.3 nm