Electronic Supplementary Information (ESI)

## Hard Magnetism in Structurally Engineered Silica Nanocomposites

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Fig. S1 TEM images of (upper) spherical mesoporous silica NPs and (bottom) rod shape mesoporous silica NPs.



Fig. S2 SEM image of spherical mesoporous silica NPs.



Fig. S3 SEM image of rod shape mesoporous silica NPs.



Fig. S4 (upper) TEM images and (bottom) STEM images of spherical silica NPs obtained by annealing at 430 °C with a heating rate of 30 °C/min.



Fig. S5 (upper) TEM images and (bottom) STEM images of spherical silica NPs obtained by annealing at 500 °C with a heating rate of 30 °C/min.



Fig. S6 (upper) TEM images and (bottom) STEM images of spherical silica NPs obtained by annealing at 600 °C with a heating rate of 30 °C/min.



Fig. S7 (upper) TEM images and (bottom) STEM images of spherical silica NPs obtained by annealing at 700 °C with a heating rate of 30 °C/min.



Fig. S8 (upper) TEM images and (bottom) STEM images of rod shape NPs obtained by annealing at 430 °C with a heating rate of 30 °C/min.



Fig. S9 (upper) TEM images and (bottom) STEM images of rod shape NPs obtained by annealing at 500 °C with a heating rate of 30 °C/min.



Fig. S10 (upper) TEM images and (bottom) STEM images of rod shape NPs obtained by annealing at 600 °C with a heating rate of 30 °C/min.



Fig. S11 (upper) TEM images and (bottom) STEM images of rod shape NPs obtained by annealing at 700 °C with a heating rate of 30 °C/min.



Fig. S12 (upper) TEM images and (bottom) STEM images of spherical NPs obtained by annealing at 600 °C with a heating rate of 2.5 °C/min.



Fig. S13 (upper) TEM images and (bottom) STEM images of spherical NPs obtained by annealing at 700 °C with a heating rate of 2.5 °C/min.



Fig. S14 (upper) TEM images and (bottom) STEM images of rod shape NPs obtained by annealing at 600 °C with a heating rate of 2.5 °C/min.



Fig. S15 (upper) TEM images and (bottom) STEM images of rod shape NPs obtained by annealing at 700 °C with a heating rate of 2.5 °C/min.



Fig. S16 Field-dependent magnetization of spherical silica NPs annealed at 600 °C, with the measurement performed at (a) 5 K, (b) 40 K, (c) 80 K, (d) 150 K, (e) 300 K. (f) Temperaturedependent magnetization of spherical silica NPs annealed at 600 °C. Curie temperature ( $T_c$ ) is 405.9 K, which was calculated by the power law fit,  $M(T) = M_0(1 - T/T_c)^\beta$  of the field-cooled (FC) measurement, where M(T) is the temperature dependent magnetization,  $M_0$  is the magnetization at T=0 K,  $T_c$  is the Curie temperature, and  $\beta$  is the critical exponent.