

**Figure captions:**

Figure S1. FT-IR spectra of the as-prepared samples.

Figure S2. Raman spectrum of the as-prepared products at the range from  $1000\text{ cm}^{-1}$  to  $1800\text{ cm}^{-1}$ .

Figure S3. FT-IR spectra of the samples which were prepared from composite colloids corroded by NaOH solution and HCl solution.

Figure S4. M-H hysteresis loops of the  $\text{SiO}_2@\text{Fe}_3\text{O}_4@\text{C}$  particles at room temperature.

Figure S5. M-H hysteresis loops of the samples after  $\text{SiO}_2$  dissolution.

Figure S6. thermogravimetric of the samples after  $\text{SiO}_2$  dissolution.

Figure S7-S8. The SEM images of as-assembled structure.

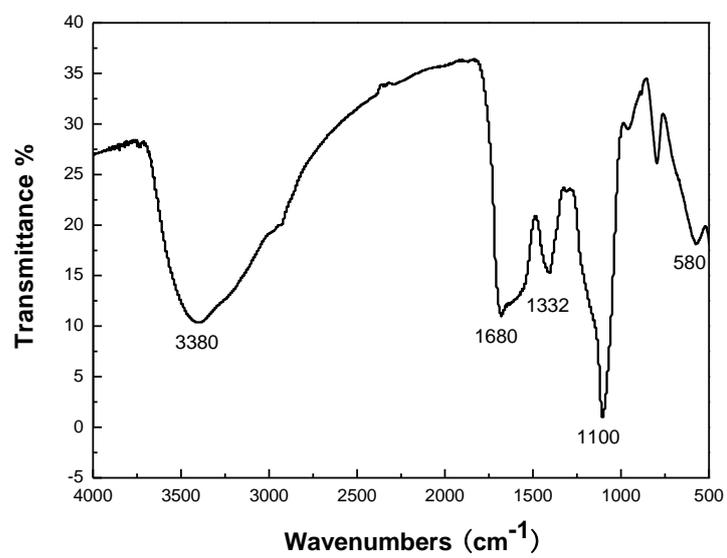


Figure S1.

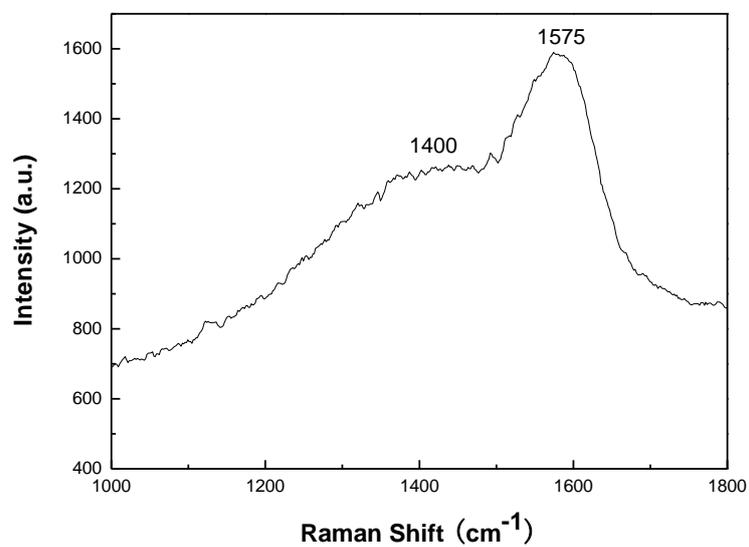


Figure S2.

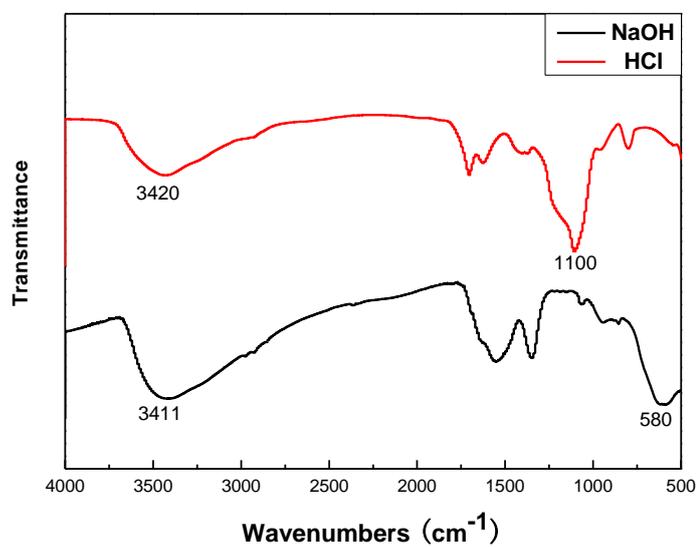


Figure S3.

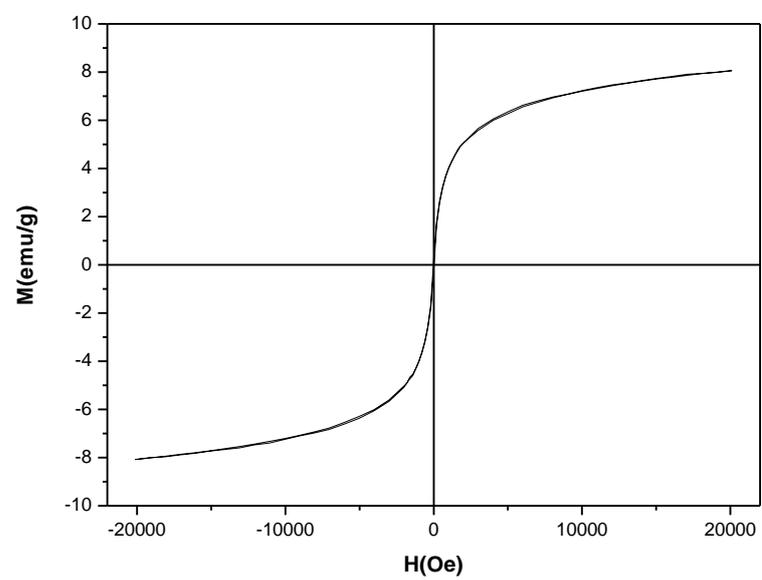


Figure S4.

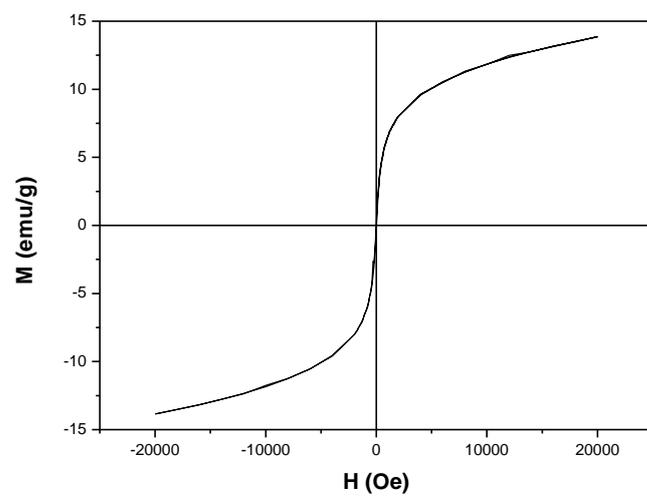


Figure S5.

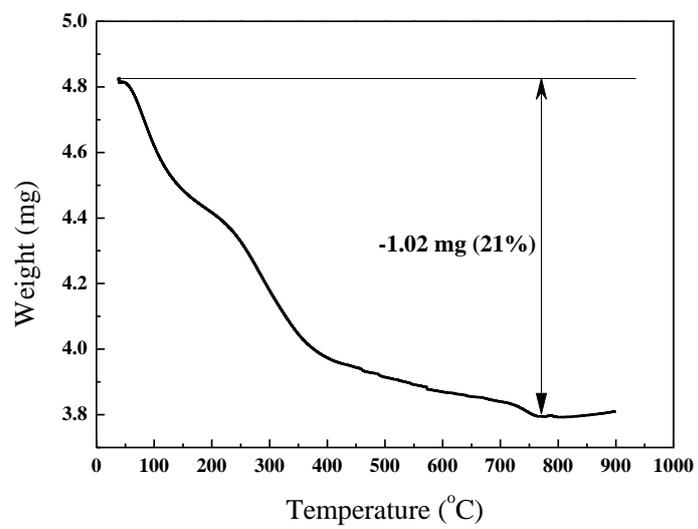


Figure 6.

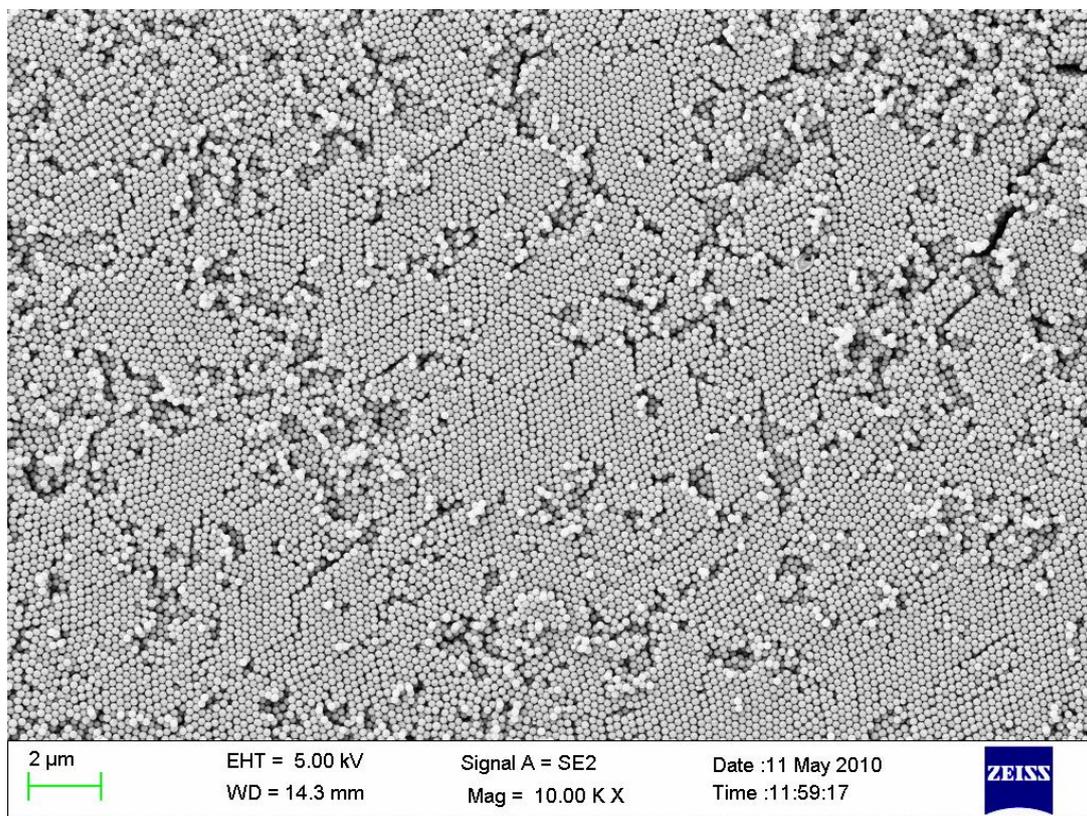


Figure S7.

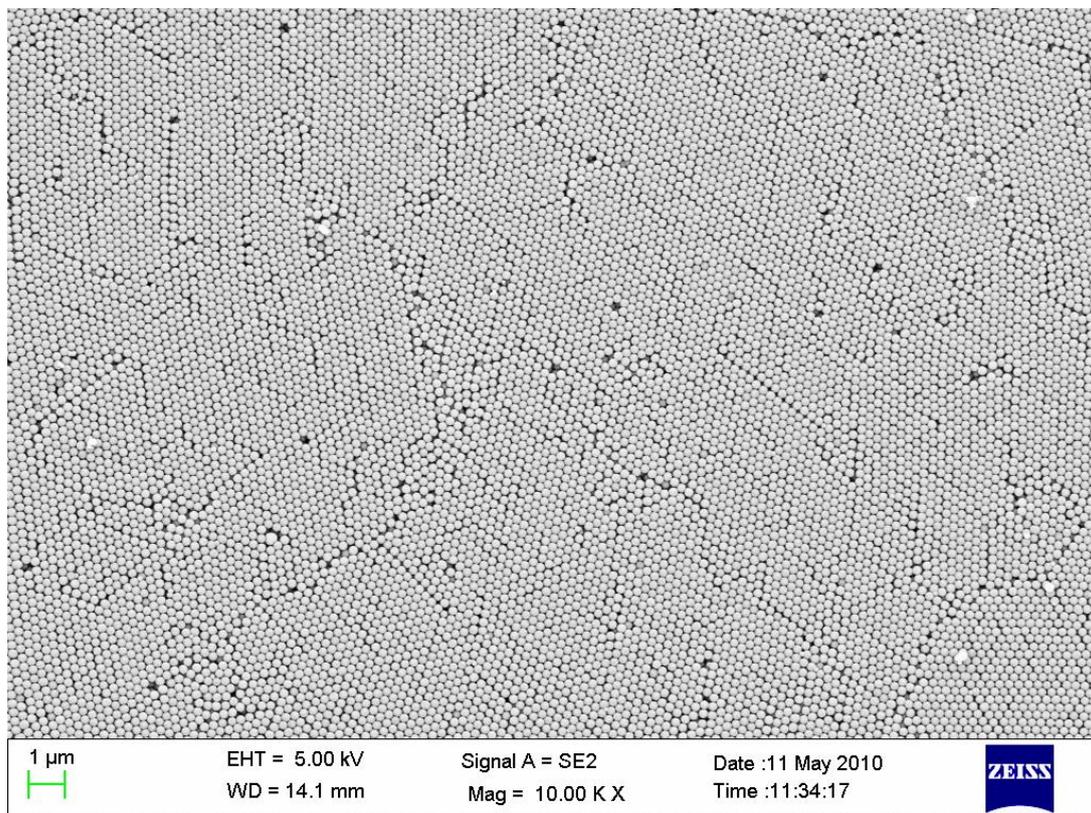


Figure S8.