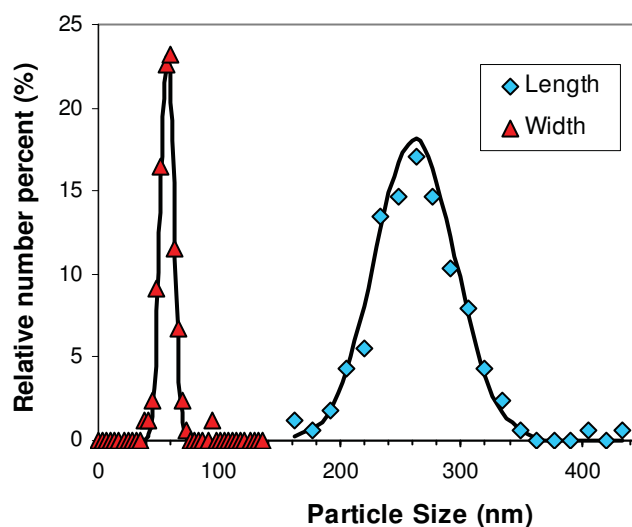


## Supporting Information Available

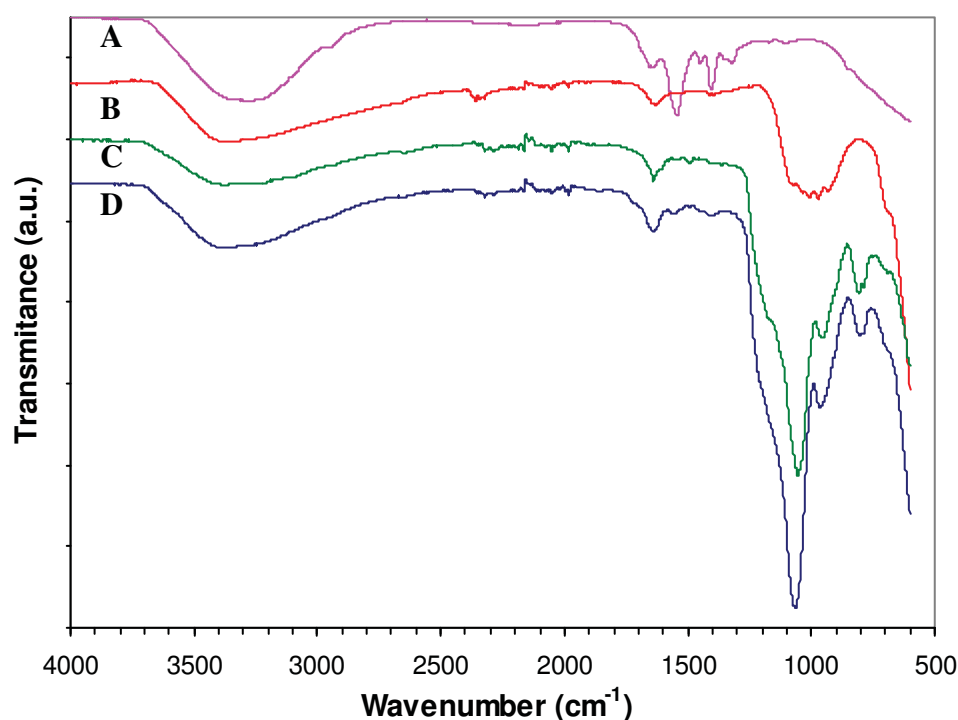
The hematite particles were synthesized and then characterized by TEM. Particle size and distribution are measured from TEM pictures of about 200 particles. The size distribution is shown in Figure 1S. The average particle length  $a$  and width  $b$  are  $262 \pm 33$  nm and  $57 \pm 5$  nm respectively with an axial ratio  $a/b = 4.5 \pm 0.5$ .



**Figure S1 : Size distribution of ellipsoidal hematite nanoparticles.**

Before and after coating, the nanoparticles were characterized with infrared spectroscopy. Figure 2S shows the full infrared spectra obtained for PAA in water at pH = 8, for the bare particles and after coating with either a simple silica shell or a PAA-silica shell. The bands in the range of  $2800\text{-}3800\text{ cm}^{-1}$  and at  $1615\text{ cm}^{-1}$  visible in all spectra can be attributed to the adsorbed water. As for the PAA solution (63wt% in water) the pH has been adjusted to a value of 8 with NaOH (pellet), the acidic groups are thus present in the ionic form  $\text{COO}^-$  and the bands at  $1550$  and  $1400\text{ cm}^{-1}$  are characteristic of the carboxylate stretch. For the coated particles the bands at  $2800\text{-}3800\text{ cm}^{-1}$  and at  $1615\text{ cm}^{-1}$  can be due to the adsorbed water and

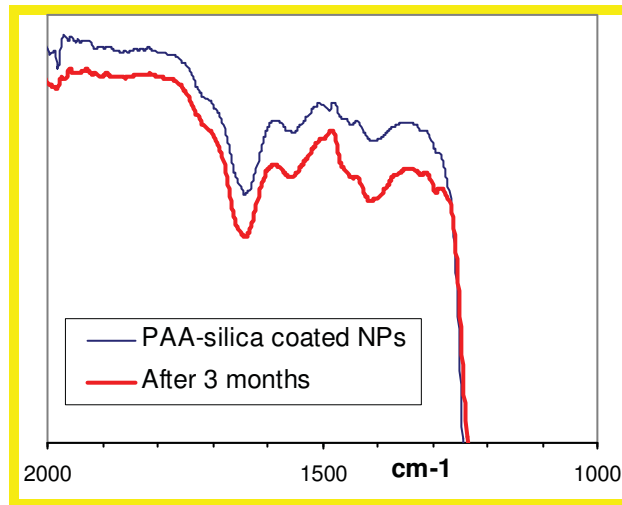
to the structural hydroxyl groups of silica. The strong peak at  $1050\text{ cm}^{-1}$  and the middle peak at  $780\text{ cm}^{-1}$  correspond to the symmetrical and asymmetrical stretching vibrations of the Si-O-Si bond from the silica shell. The  $960\text{ cm}^{-1}$  band can be attributed to the stretches of Si-OH and Si-O<sup>-</sup> groups. The PAA-silicated hematite spectrum shows the characteristic carboxylate bands from PAA at  $1550$  and  $1400\text{ cm}^{-1}$  and thus demonstrate that the polymer has been successfully grafted onto the particles.



**Figure S2 : Overlay of infra-red spectra of PAA in water (A, pink), hematite nanoparticles (B, red), silicated hematite NPs (C, green) and PAA-silicated hematite NPs (D, blue).**

The temporal stability of the PAA-silica coating was verified after three months of storage. The sample was analyzed by IR spectroscopy after coating and stored for three months. After a new washing step with three centrifugation and water dispersion cycles, the particles were re-analyzed. The IR spectroscopy results are compared in Figure S3, showing the IR spectra from  $1000$  to  $2000\text{ cm}^{-1}$  where the characteristic band of the carboxylate stretch from the PAA

*is located. The superposition of the two spectra clearly shows the stability of the PAA coating even after three month of storage and repeated centrifugation-washing cycles.*



**Figure 3S : Overlay of infra-red spectra of silicated hematite NPs after coating (blue) and after three months (red).**

To study the influence of added salt on the aggregation behavior of PAA-SiO<sub>2</sub>-hematite nanoparticles, the hydrodynamic radii for the aqueous suspensions at 0.01g/L and 25°C were monitored before and after salt addition (KCl at 200mM) and then after a repeated centrifugation/washing procedure. After the addition of salt, the hydrodynamic radius  $R_h$  increases from 110nm to 200nm, clearly indicating the salt-induced aggregation of the particles. The same suspension was then washed by four cycles of centrifugation and re-dispersion in pure water. After this procedure, the measured  $R_h$  value of  $R_h = 130$  nm is almost the same as initially obtained for the stable suspension, showing that the aggregation has been reversible and that the particles can be re-dispersed almost completely despite the fact that they not only underwent a salt-induced aggregation process, but had also been compacted through multiple centrifugation steps.

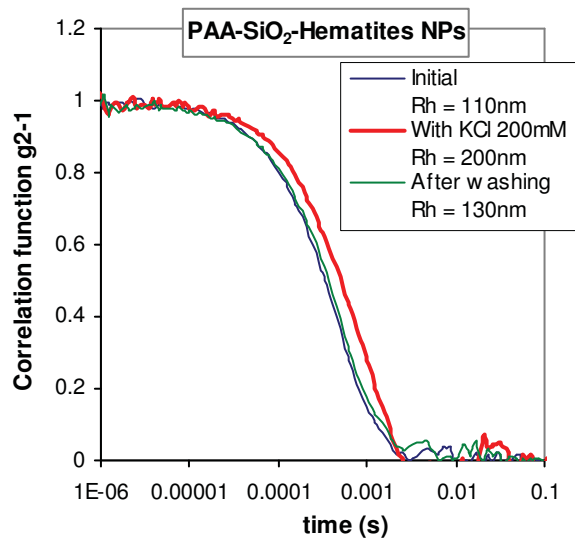


Figure 4S : Correlation functions of PAA-SiO<sub>2</sub>-Hematite NPs before (blue) and with KCl at 200mM (red), and after washing (green).