ADVANCED MATERIALS

Supporting Information

for

Advanced Materials, adma.200400027

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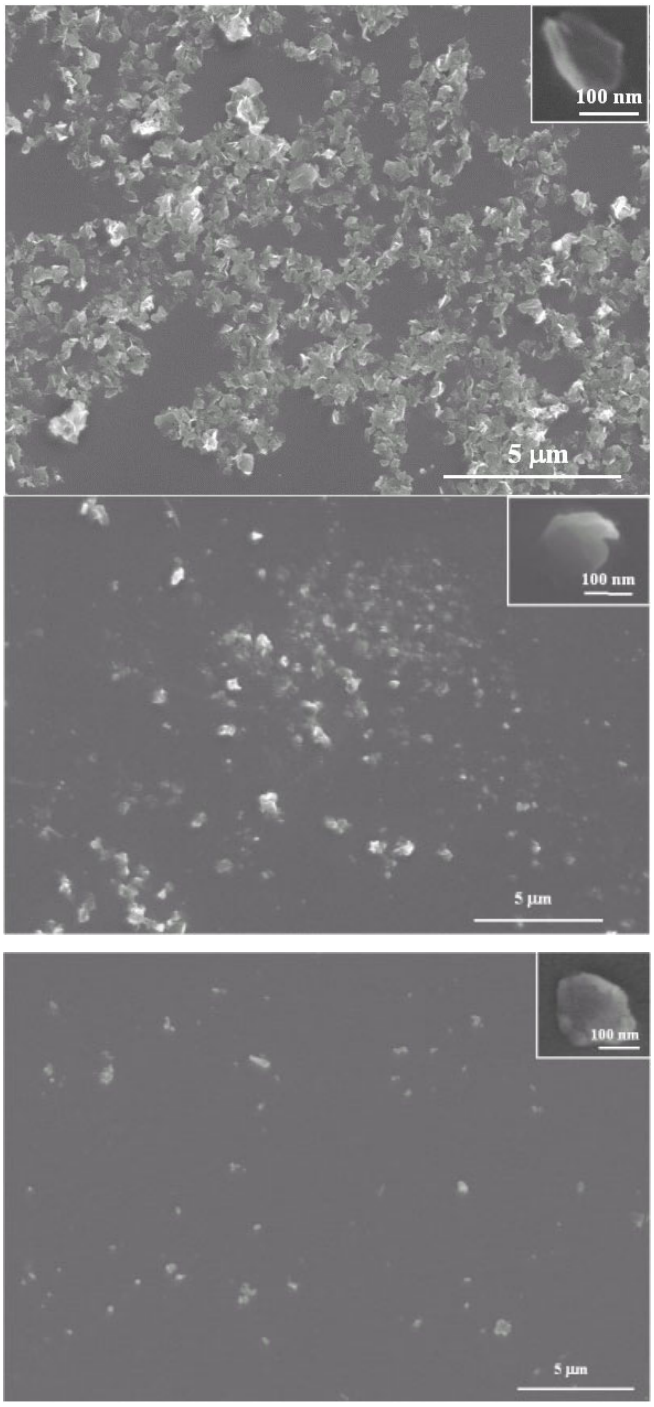
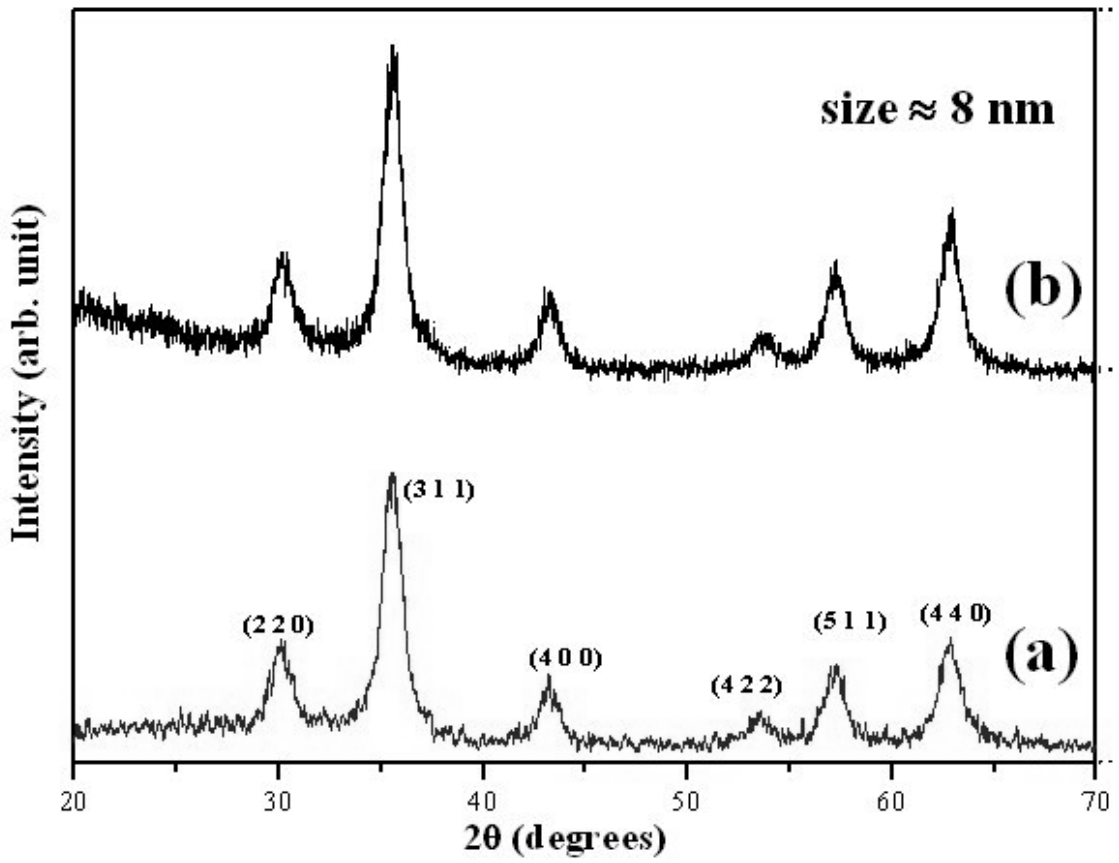


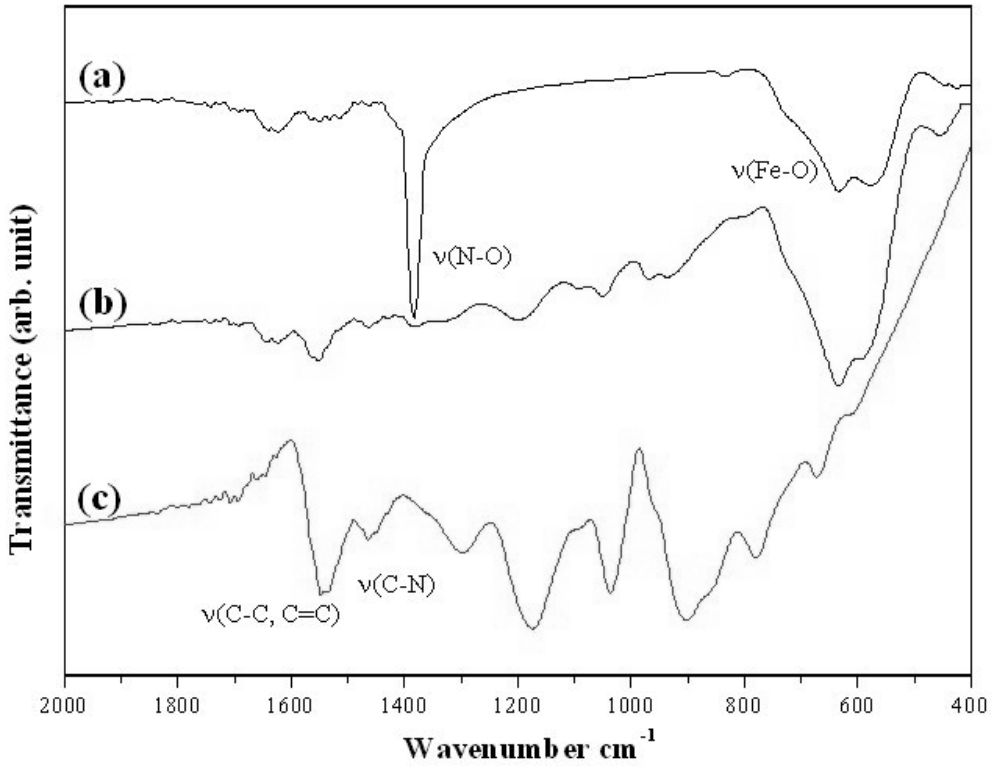
Supporting information 1. The Field Emission Scanning Electron Microscopy (FE-SEM) images of (a) pristine LDHs (b) DNA-LDH nanohybrids and (c) the DNA-LDH nanohybrids coated with polyethylene oxide (Brij 58). Each inset image represents the high magnified image of individual particle.

The pristine LDHs were synthesized by coprecipitation of $Mg(NO_3)_2$, $Al(NO_3)_3$ mixed solution and the formula was proved to be $Mg_2Al(OH)_6(NO_3)\cdot 0.1H_2O$. The DNA-LDH nanohybrids were synthesized through an ion exchange route. The DNA-LDH nanohybrids were coated with PEO by mixing PEO/EtOH solution with DNA-LDH nanohybrid (PEO/DNA-LDH = 0.05 wt %). LDHs and DNA-LDH nanohybrids were dispersed in water, and the coated DNA-LDH nanohybrids were dispersed in EtOH. All the particles, pristine LDHs, DNA-LDH nanohybrids and PEO-coated DNA-LDH nanohybrid are average 200 nm in size, and evenly dispersed in each aqueous media.



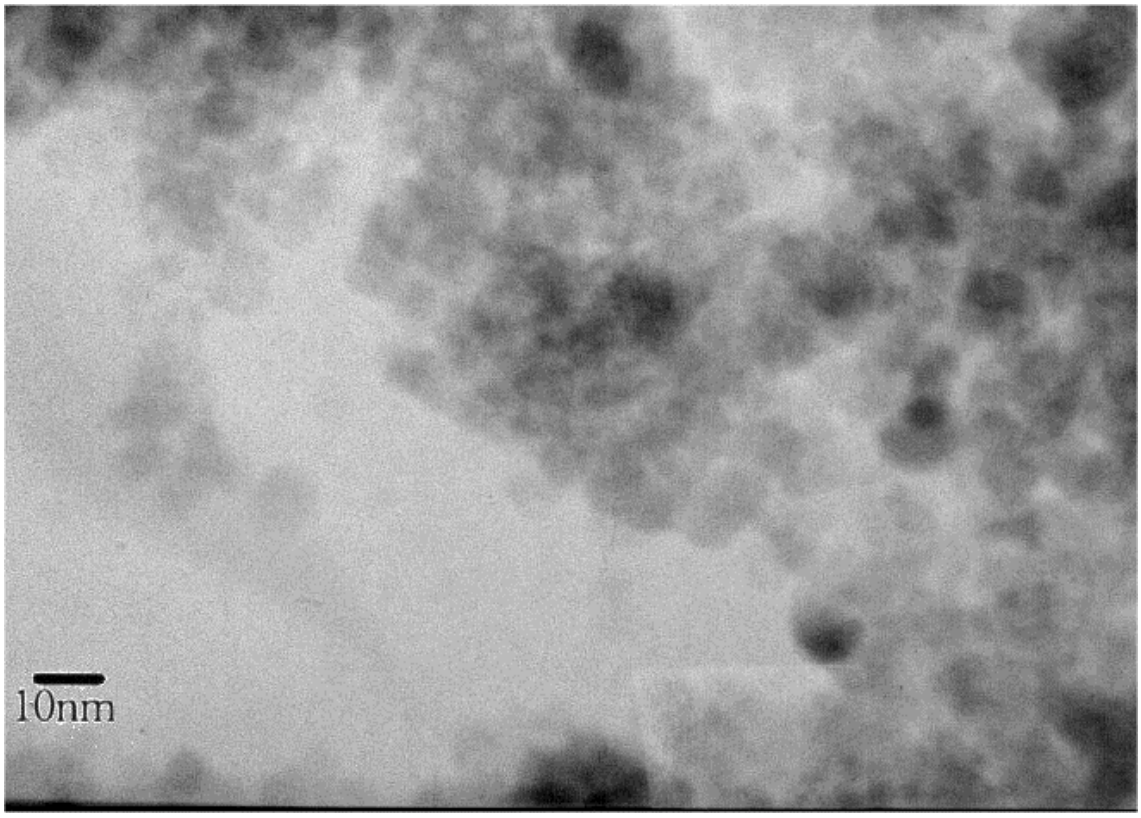
Supporting information 2. The XRD patterns of (a) maghemite nanoparticles and (b) PPY-MAG nanohybrids.

The peaks at 2θ = 30.1, 35.6, 43.2, 53.8 and 57.7 ^{o} are indexed to (220), (311), (400), (422) and (511) of maghemite. The size of the nanoparticles was estimated by Scherrer's equation to be ≈ 8 nm, well consistent with that measured by TEM.



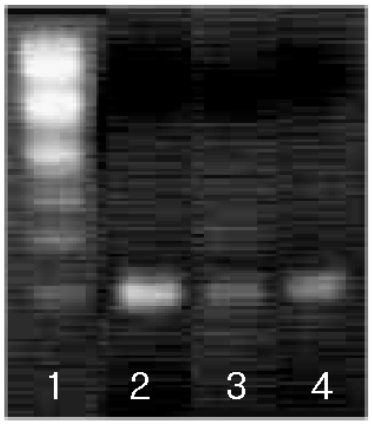
Supporting information 3. FT-IR spectrum of (a) maghemite (b) PPY-MAG nanohybrids and (c) PPY (polypyrrole).

The FT-IR spectrum of PPY-MAG nanohybrids shows the characteristic band of both maghemite and bulk PPY. This indicates that polypyrrole is coated on the maghemite surface. The band at 635 cm^{-1} in the maghemite spectrum is assigned to Fe-O vibration. In addition, there is a narrow and very intensive absorption band at 1385 cm^{-1} due to the N-O stretching vibration. This indicates the presence of NO_3^- species on the surface of maghemite. However, the N-O vibration could not be detected in the spectrum of the PPY-MAG nanohybrid, which indicates complete exchange of surface NO_3^- by polypyrrole. In the spectrum of PPY-MAG nanohybrid, the bands around 1550 cm^{-1} indicates C-C and C=C stretching, while the 1460 cm^{-1} band stands for C-N stretching, which means the successful coating of polypyrrole on the surface of maghemite nanoparticles.



Supporting information 4. The TEM image of maghemite nanoparticles.

The size of the maghemite nanoparticles is about 7 nm. Compared with the PPY-MAG nanohybrid (Fig 2(a)), maghemite nanoparticles are more heavily aggregated, likely due to the absence of surface PPY.



Supporting information 5. The gel electrophoresis results for PCR products from DNA-mixed ink. Lane 1 : 100 bp ladder marker, lane 2 : positive control of 100 bp genetic code DNA, lane 3 : from an ink containing DNA at 10 nM concentration, lane 4 : PPY-MAG nanohybrids treated with the ink of lane 3.

Simple PCR of the ink resulted in a very weak band whereas employment of PPY-MAG nanoparticles led to a clear band to confirm their high DNA retrieval efficiency.