

Supporting information

In our work, two experiments were designed to compare the method in our article with solely utilizing the high temperature swelling method. It can be found from Figure S1 that the multifunctional beads via combining conventional swelling method with high-temperature swelling method have bright and uniform red color, but PSEMBs via solely utilizing the latter in the experiment have little fluorescence under UV light. This phenomenon also demonstrates in profile that the rearrangement of polymer chains under the high temperature causes the changes of the bead structure and beads after heat treatment have difficulty in packing nanoparticles again. Of course, the theoretical explanation needs to be further investigated.

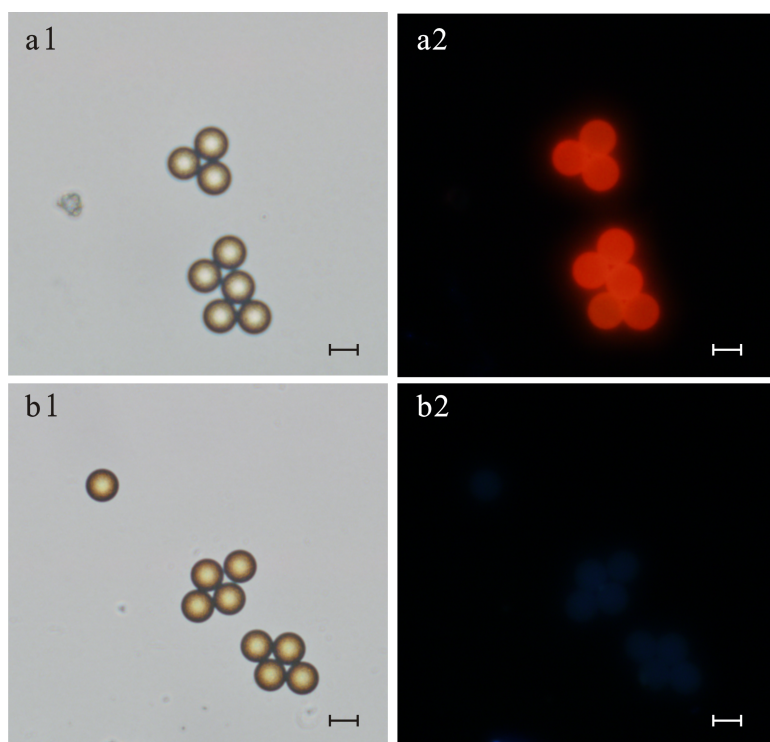


Figure S1 The microscope images of beads via two different methods under light field and UV: a1, a2 are the beads prepared by combining conventional swelling method and high-temperature swelling method and b1, b2 are the beads prepared via solely using high-temperature swelling method.

Figure S2 shows Hysteresis loops of functional PSEMBs. a1 is the comparison of beads fabricated in different sequence, MNPs/QDs beads, QDs-MNPs beads and MNPs-QDs beads; a2 demonstrates the

effect of QDs incorporated on magnetization of MNPs-QD-encoded PSEMBs. It was found that in swelling process, whether to adding QDs or not, the adding sequence and concentration of QDs in solution system have little effect on magnetic properties and performances of PSEMBs.

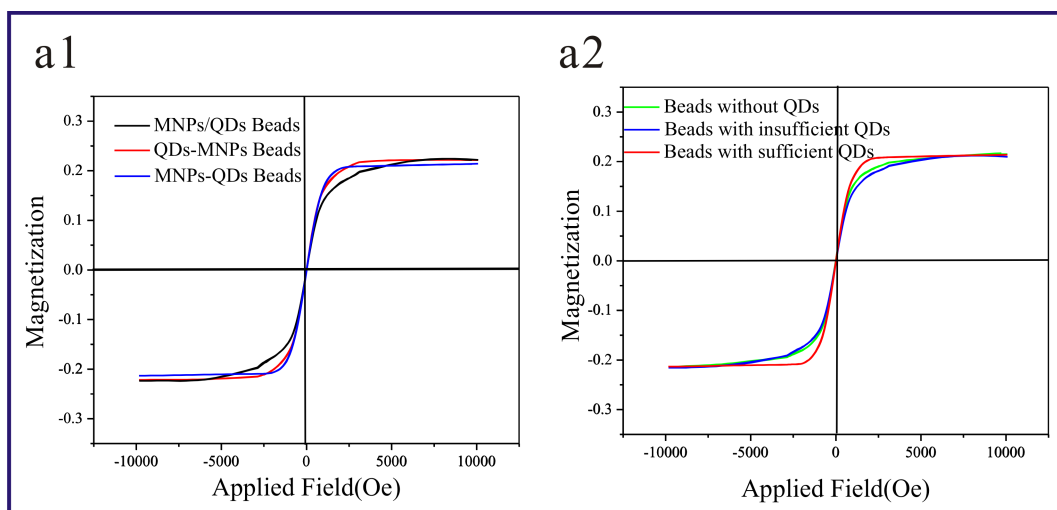


Figure S2. Hysteresis loops of functional PSEMBs, a1 is comparison of beads doping MNPs and QDs in different sequence, and a2 is the effect of the concentration of QDs on magnetization of final beads.

It can be seen from Figure S3 that MNPs-QD-encoded PSEMBs exhibit negligible coercivity (H_c) and remanence as typical superparamagnetic materials. As more MNPs are packed into beads, the total magnetic force and net magnetization would significantly increase, and the efficiency of separation was obviously strengthened.

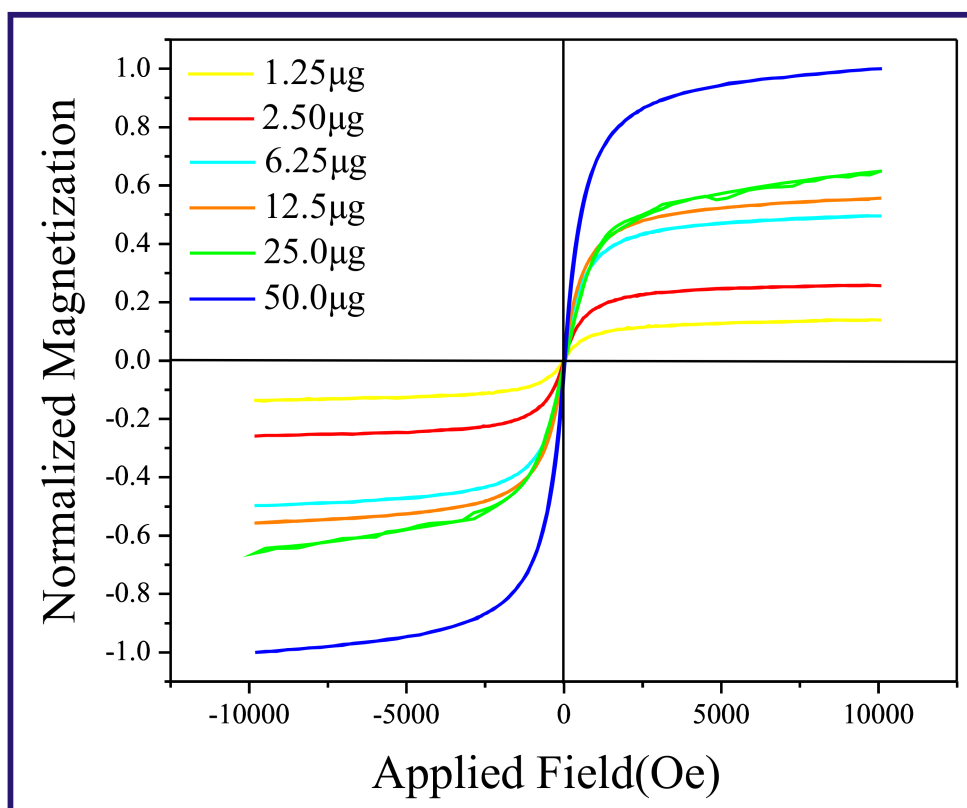


Figure S3. Hysteresis loops of MNPs-QD-encoded PSEMBs doping with different quality of iron oxide nanocrystals respective to 1 mg beads.