Electronic Supplementary Material (ESI) for Nanoscale


*ESI*

# A General Route to Well-defined Magneto- or Fluorescent-Plasmonic Nanohybrids

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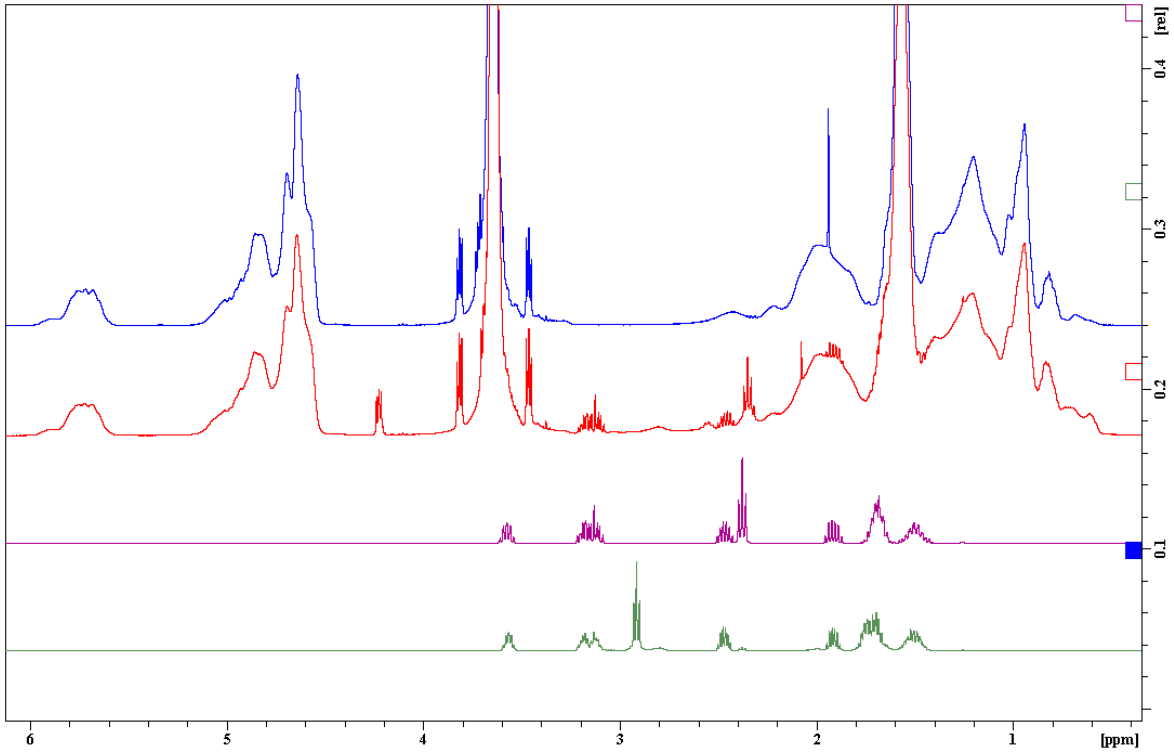


**Figure S 1: Superimposed NMR spectra of lipoic acid 5 (purple), lipoyl chloride 6 (green), PI-*b*-PEG-LA 7 (red), PI-*b*-PEG-OH 1 (blue) in $CDCl_3$**

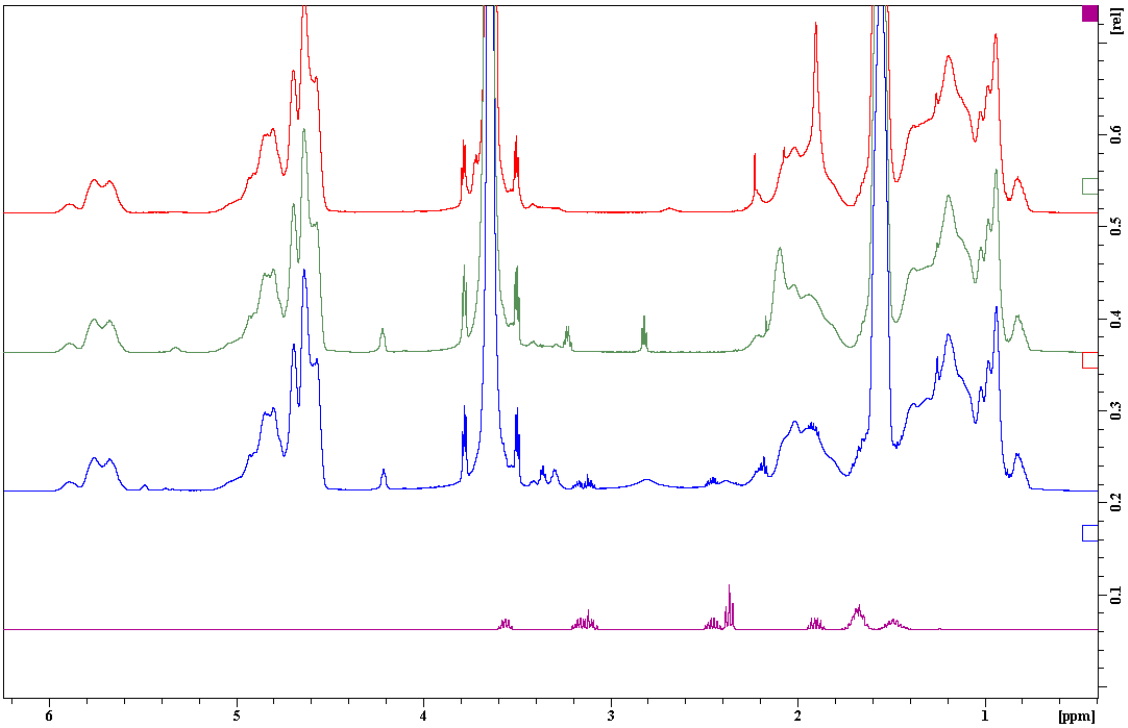


**Figure S 2: Superimposed NMR spectra of PI-*b*-PEG-OH 1 (red), PI-*b*-PEG-$NH_2$ 3 (green), PI-*b*-PEG-LA 4 (blue) and lipoic acid 5 (purple) in $CDCl_3$.**

The Hybrids were purified by magnetic columns as described by Kloust *et al.*[30] In **Figure S3** the raw product and the obtained solutions are shown.

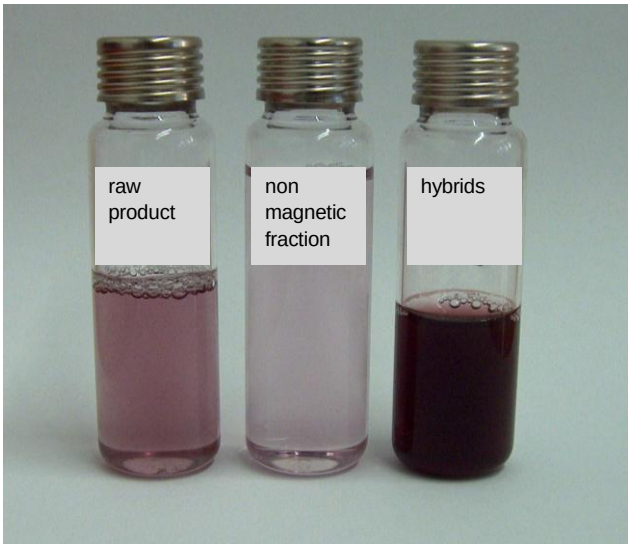


**Figure S3. Raw product and non magnetic fraction as well as magnetic fraction (hybrids).**

Alternatively to the lipoic acid functionalization of the PI-*b*-PEG, the encapsulated Nanoparticles can be functionalized with 2,2'-dithiobis(ethylamine) at the polymer end group using BrCN activation. In detail, 9 nmol $Fe_2O_3$ NPs were transferred into micelles of PI-*b*-PEG (72 mg) and polymerized according to Kloust *et al.*,[30] using 1-pentanol (30 µL), styrene (12.5 µL), divinylbenzene (12.5 µL),

and radical initiator 2,2′-azobis[2-(2-imidazolin-2-yl)propane] dihydrochloride (1 mg). After magnetic purification the particles were transferred into sodium carbonate buffer (pH = 8.5) and the solution was cooled to 4 °C. Than 3 mg of BrCN in 200 µL of acetonitrile and 4 min later 3 mg of 2,2'-dithiobis(ethylamine) in 300 µL of water were added. Finally the product was stirred at 4 °C for 20 h and the functionalized particles were purified by means of magnetic columns. The attachment with Au NPs works as described with lipoic acid functionalized particles. The final hybrids after magnetic purification are shown in **Figure S4**.

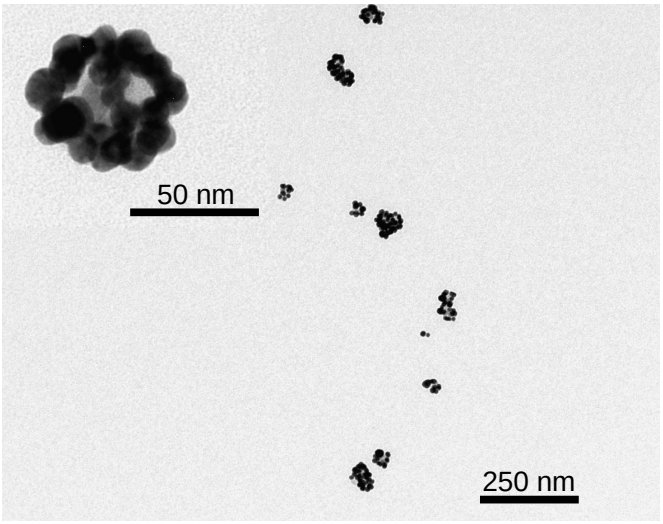


**Figure S4. TEM image of gold/iron oxide hybrids. The disulfide was provided using 2,2'-dithiobis(ethylamine).**

**Synthesis of 2,2'-dithiobis(ethylamine) functionalized $Fe_2O_3$ NPs**

Polystyrene encapsulated $Fe_2O_3$ (3 nmol) dissolved in of sodium carbonate buffer (3 mL, pH 9.2) were cooled with ice-cold water and mixed with BrCN (3 mg) dissolved in 200 µL of acetonitrile. After 4 min 2,2'-Dithiobis(ethylamine) (3 mg) dissolved in 500 mL of water were added and the stirred for 10 h at 4 °C. Finally the product was isolated *via* magnetic columns.

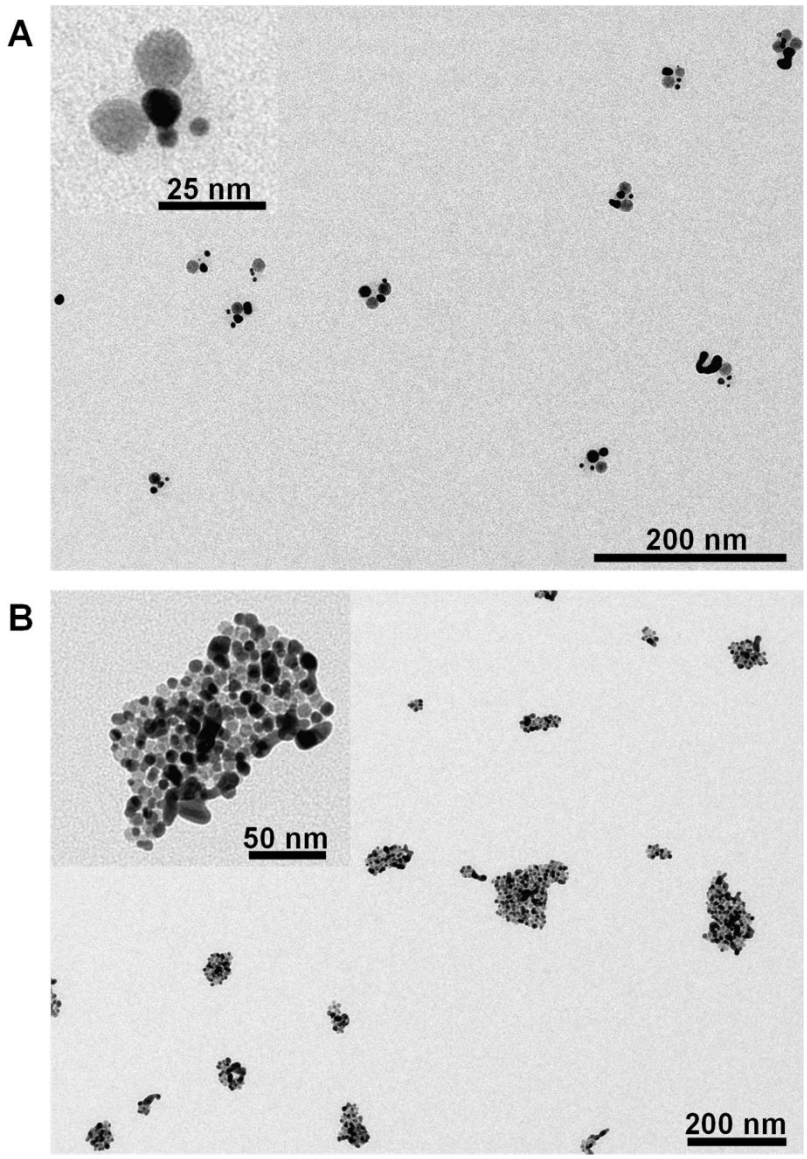


**Figure S5. TEM image of gold/iron oxide hybrids grown on OH-functionalized $Fe_2O_3$ NPs (A) and COOH-functionalized $Fe_2O_3$ NPs (B).**

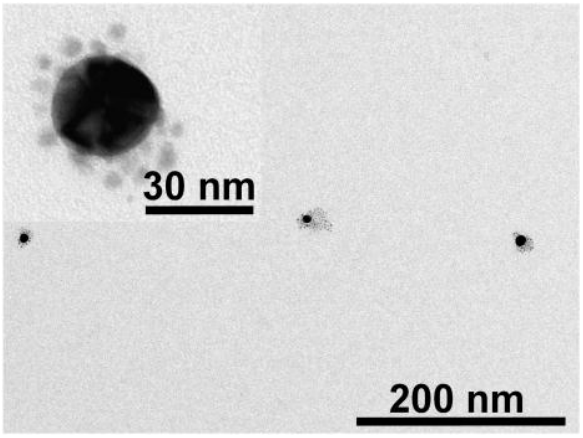


**Figure S6: TEM-image of Ag/QD core/satellite hybrids.**

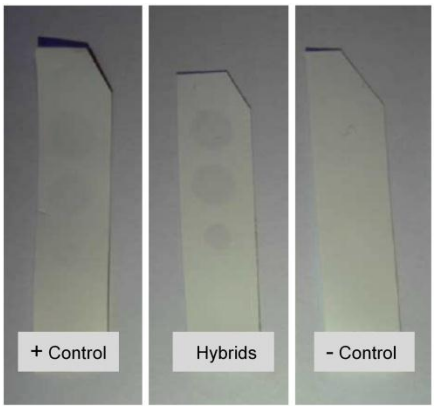


**Figure S7. Dot-blot analysis of Ms mAb to ovalbumin conjugated hybrids on ovalbumin coated nitrocellulose membrane. The positive control was made with Ms mAb to ovalbumin coated 40 nm gold NPs, the negative control with unfunctionalized hybrids.**