Electronic Supplementary Material (ESI) for Soft Matter.

ESI

A Quick One-Step Synthesis of Luminescent Gold Nanospheres

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Photophysical Measurements

Spectrofluorimetric grade solvents were used for the photophysical investigations in solution. A Perkin Elmer Lambda 900 spectrophotometer was employed to obtain the absorption spectra. Steady-state emission spectra were recorded on a Horiba Jobin-Yvon Fluorolog-3 FL3-211 spectrometer equipped with a 450 W xenon arc lamp, double-grating excitation and single-grating emission monochromators (2.1 nm/mm dispersion; 1200 grooves/mm), and a Hamamatsu R928 photomultiplier tube. Emission and excitation spectra were corrected for source intensity (lamp and grating) and emission spectral response (detector and grating) by standard correction curves. Time-resolved measurements were performed using the time-correlated single-photon counting (TCSPC) option on the Fluorolog 3. Laser Nanoled source (λ_{em} = 379 nm; 750 ps duration, 63 pJ power, 1 MHz repetition rate) was used to excite the sample; nanoled was mounted directly on the sample chamber at 90° to a single-grating emission monochromator and collected with a TBX-04-D single-photon-counting detector. The photons collected at the detector are correlated by a time-to-amplitude converter (TAC) to the excitation pulse. Signals were collected using an IBH Data Station Hub photon-counting module, and data analysis was performed using the commercially available DAS6 software (Horiba Jobin-Yvon IBH). The fitting procedure of the emission intensity decays I(t) uses a multi-exponential model according to the expression

$$I(t) = \Sigma_i \alpha_i \exp(-t/\tau_i)$$

where τ_i are the decay times and α_i represent the amplitudes of the components at t=0. Goodness of fit was assessed by minimizing the reduced Chi squared function (χ^2) and visual inspection of the weighted residuals. Emission quantum yields were determined using the optically dilute method [1] on aerated solutions which absorbance at excitation wavelengths was < 0.1; 9,10-diphenylanthracene in cyclohexane was used as standard (Φ = 0.96) [2] for PyAm and PyAm@AuNS; $Ru(bipy)_3Cl_2$ (bipy = 2,2'-bipyridine) in water was used as standard ($\Phi = 0.040$) [3] for FluoThio and FluoThio@AuNS; cresyl violet perchlorate in methanol was used as standard ($\Phi = 0.54$) [4] for CryV and CryV@AuNS. The experimental uncertainty on the emission quantum yields is 5%.

Morphological Characterization

The size and morphology of the gold nanoparticles were measured using a transmission electron microscope (Jeol JEM-1400 Plus 120 kV). The samples for transmission electron microscopy (TEM) were prepared by depositing a drop of a diluted solution on 300 mesh copper grids. After evaporation of the solvent in air at room temperature, the particles were observed at an operating voltage of 80 kV. Size distribution of nanoparticles was measured by dynamic light scattering, by using a Zetasizer Nano S from Malvern Instruments (632.8 nm, 4 mW HeNe gas laser, avalanche photodiode detector, 175° detection). Measurements were performed in triplicate at 25°C.

[1] J. N. Demas, G. A. Crosby, J. Phys. *Chem.*, 1971, **75**, 991-1024.

[2] W. R. Ware, W Rothman, *Chem. Phys. Lett.*, 1976, **39**, 449-453.

[3] K. Suzuki, A. Kobayashi, S. Kaneko, K. Takehira, T. Yoshihara, H. Ishida, Y. Shiina, S. Oishi, S. Tobita, *Phys. Chem. Chem. Phys.*, 2009, **11**, 9850-9860.

[4] D. Magde, J. H. Brannon, T. L. Cremers, J. Olmsted, *J. Chem. Phys.*, 1979, **83**, 696-699.

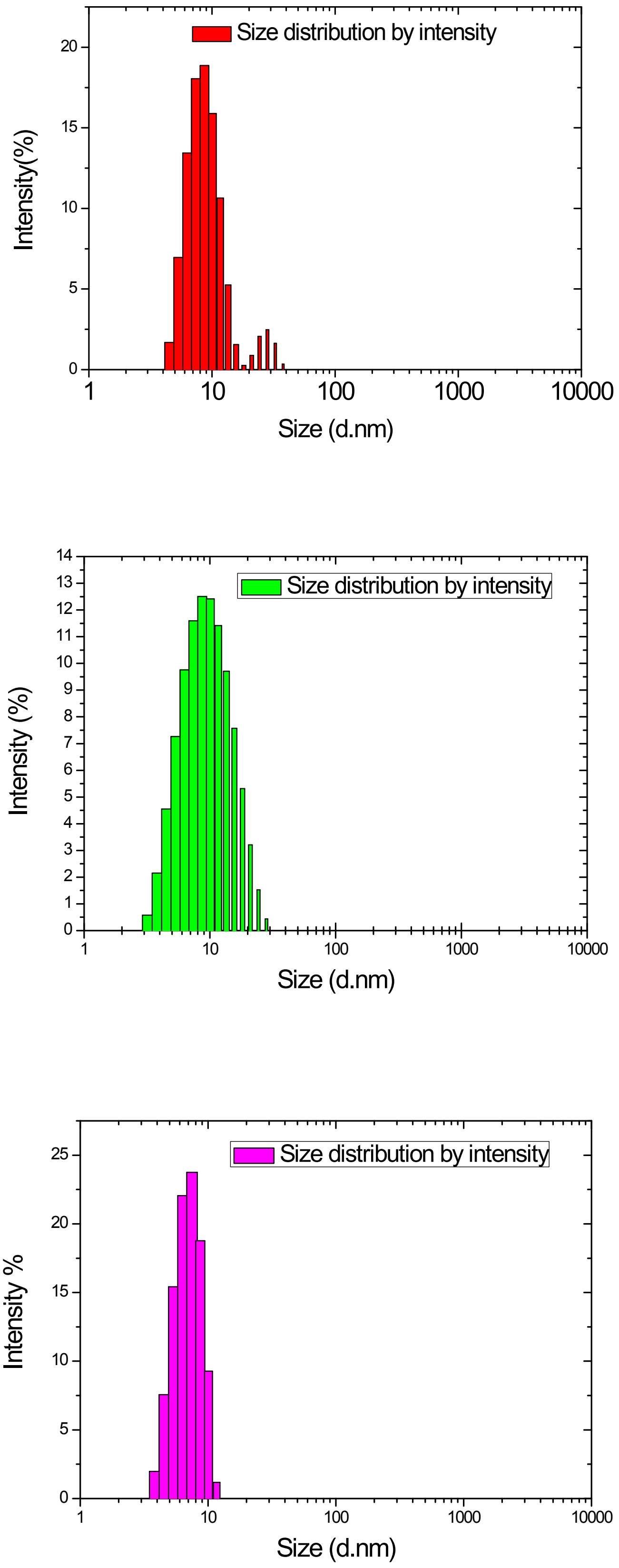

Figure S1. Size distribution of PyAm@AuNS (red diagram), FluoThio@AuNS (green diagram), CryV@AuNS (violet diagram) in chloroform solution using DLS technique.

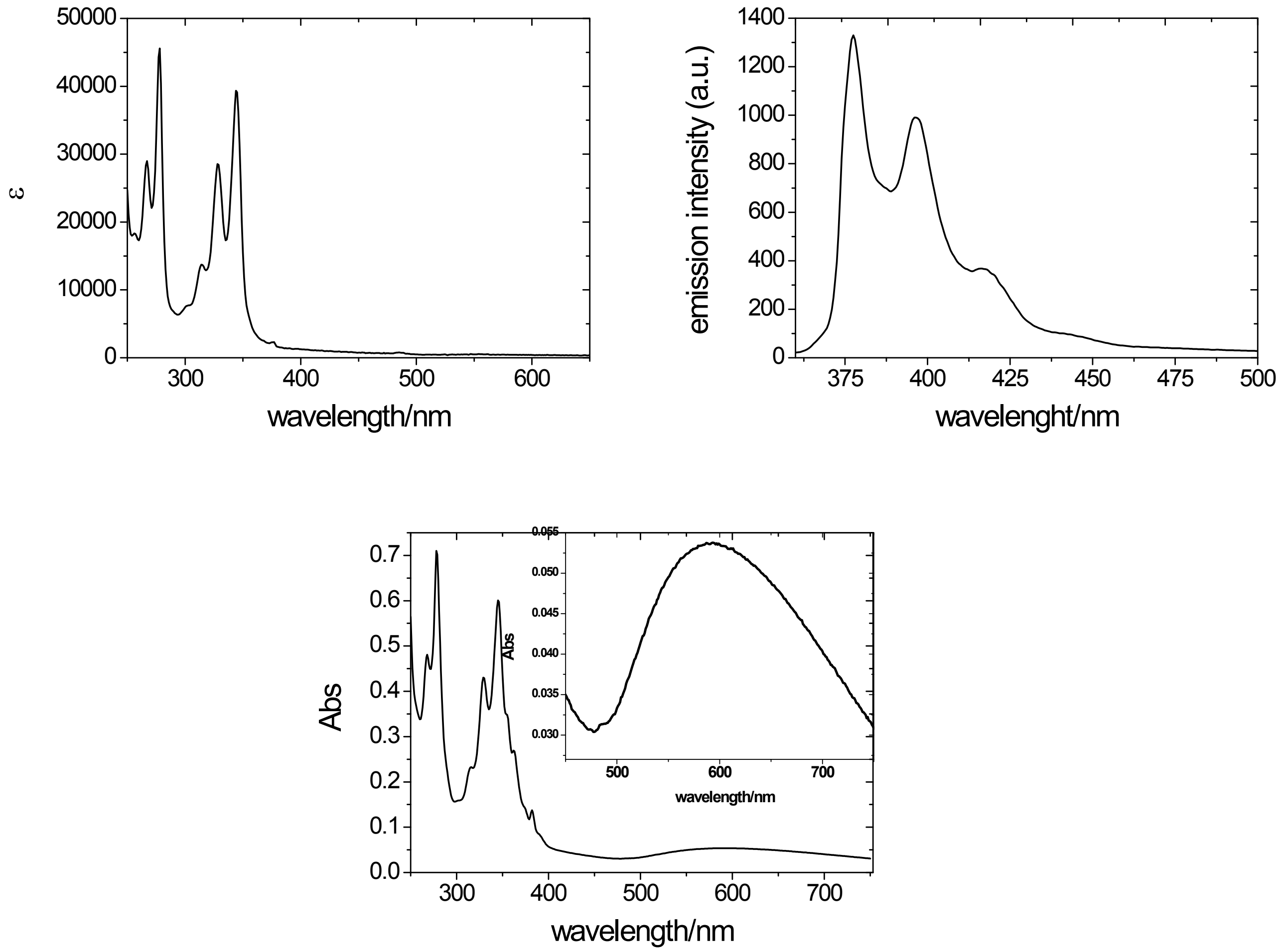

Figure S2. Absorption (top left) and emission (top right; λ_{ex} = 330 nm) spectra of 1-pyrenemethylamine hydrochloride (PyAm) in chloroform solution; absorption spectrum (down) of PyAm@AuNS in chloroform solution.

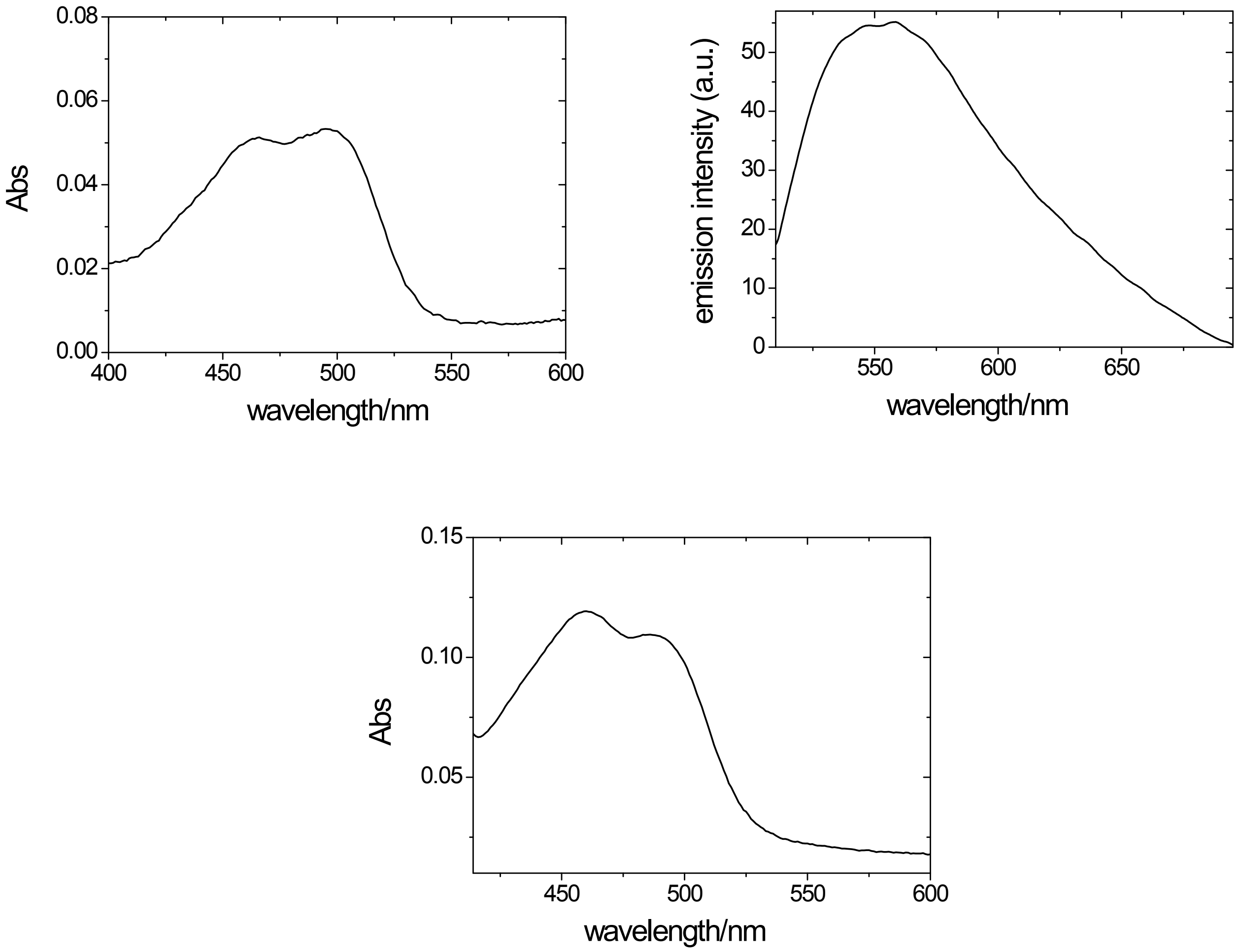

Figure S3. Absorption (top left) and emission (top right; λ_{ex} = 458 nm) spectra of fluorescein isothiocyanate (FluoThio) in chloroform solution (partially soluble, ε value not available); absorption spectrum (down) of FluoThio@AuNS in chloroform solution

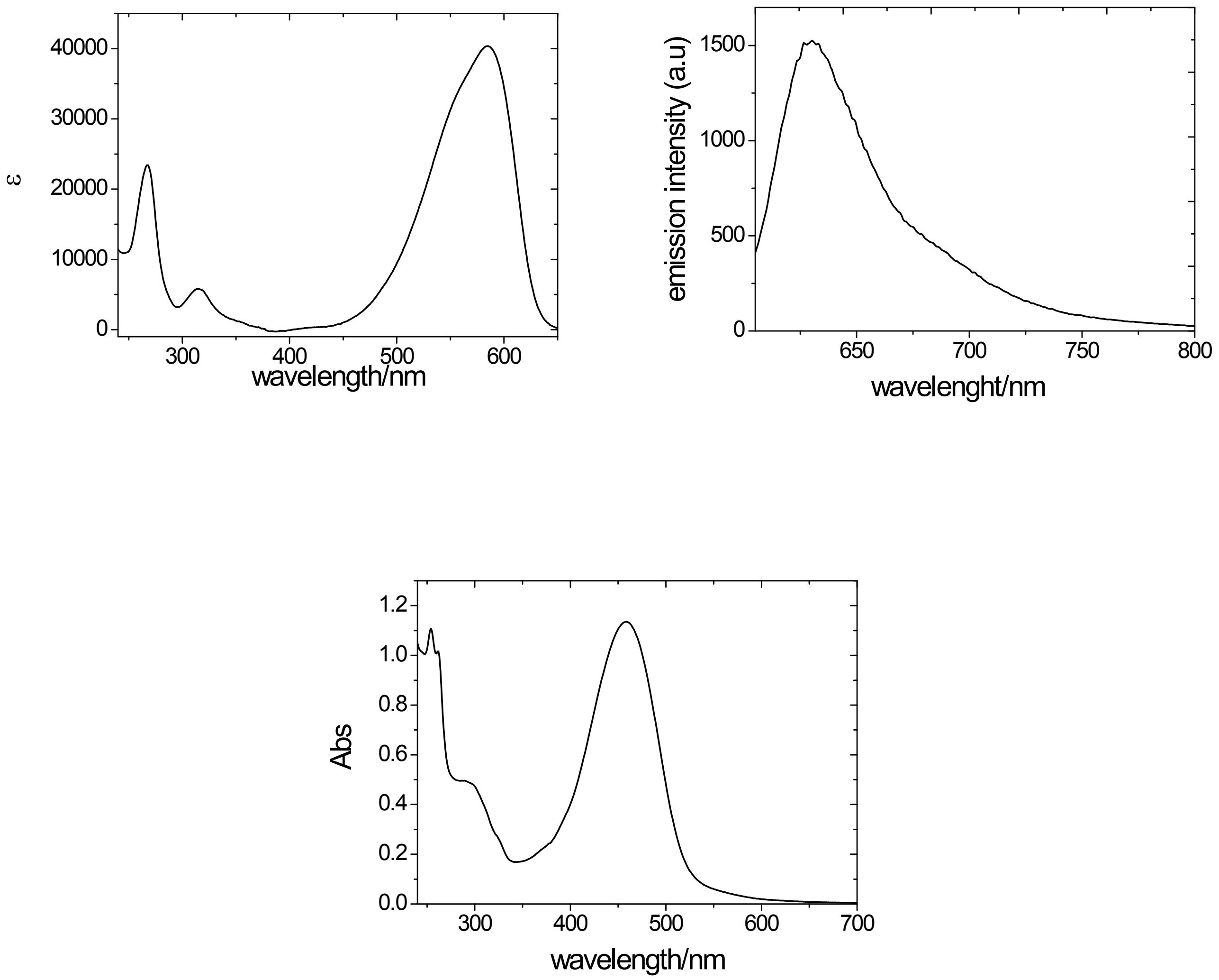

Figure S4. Absorption (top left) and emission (top right; λ_{ex} = 550 nm) spectra of cresyl violet perchlorate (CryV) in water solution; the absorption spectrum (down) of CryV@AuNS in chloroform solution