Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Morphology Modulation and Application of Au(I)-Thiolate Nanostructures

Hui Nie, Minjie Li,* Yajiao Hao, Xudong Wang, Sheng Gao, Peng Wang, Bo Ju, Sean Xiao-An Zhang*

State Key Lab of Supramolecular Structure and Materials, Jilin University, Changchun, P.R. China.

E-mail: liminjie@jlu.edu.cn, seanzhang@jlu.edu.cn

Quantum yields (QY) measurements of photoluminescent Au clusters

Reference on quantum yields measurements: Lakowicz, J. R. *Principles of Fluorescence Spectroscopy*, 2nd Ed., **1999**, Kluwer Academic/Plenum Publishers, New York. Fluorescence quantum yield was measured by using polymer-blend dots aqueous solution[1] (Φ_F = 0.56) for the red photoluminescent Au clusters and anthracene ethanol solution (Φ_F = 0.27) for the blue photoluminescent Au clusters as fluorescence standards. The absorbance of the sample at the excitation wavelength (optical density < 0.1 to minimize inner-filter effects) was matched with the standard. The quantum yield was calculated using the below equation:

$$\varphi_x = \varphi_{std}\left[\frac{I_x}{A_x}\right]\left[\frac{A_{std}}{I_{std}}\right]\left[\frac{\eta_x}{\eta_{std}}\right]^2$$

Where φ is the quantum yield, I is the measured integrated emission intensity, and A is the optical density, and η the refractive index. The subscript "*std*" refers to the reference fluorophore of known quantum yield.

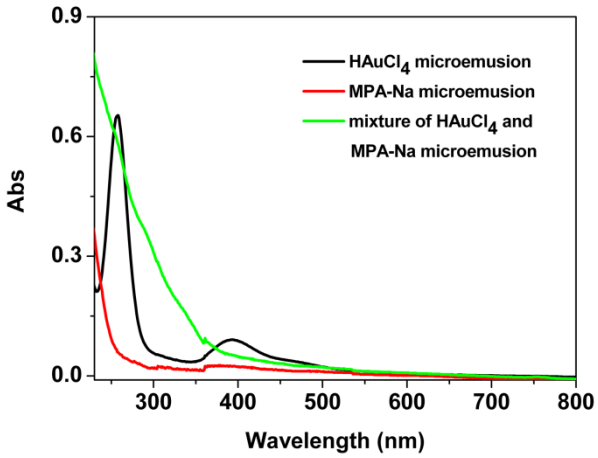

Fig. S1 UV-vis absorption spectra of $HAuCl_4$ microemulsion, MPA-Na microemulsion and their mixture ($HAuCl_4$ microemulsion and MPA-Na microemulsion mixed at room temperatures).

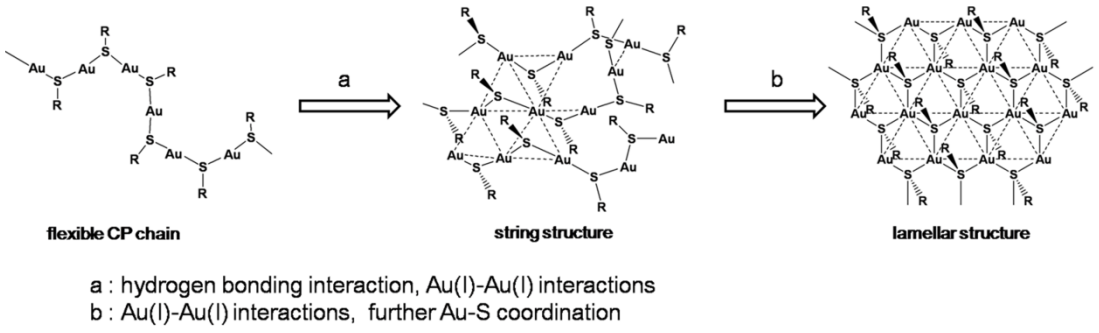

Fig. S2 The pathway of the assembly of Au(I)-MPA CPs to quasi-rectangular nanosheets in microemulsion.

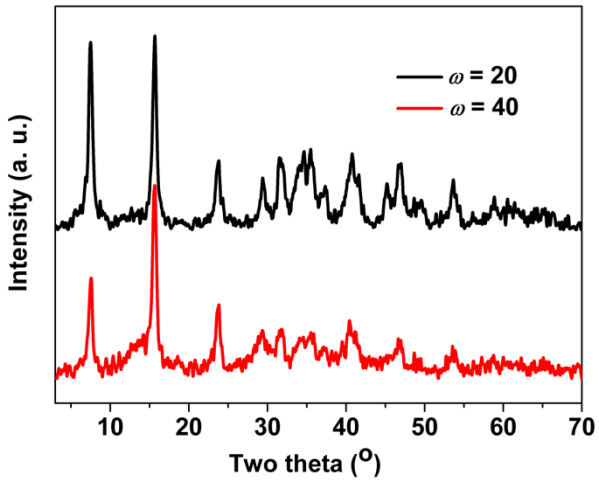

Fig. S3 XRD patterns of M-Au(I)-MPA nanostructures with *w* values of 20 and 40 respectively.

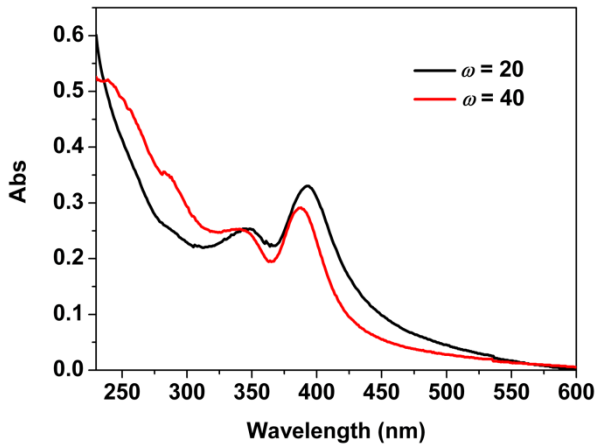

Fig. S4 UV-vis absorption spectra of M-Au(I)-MPA nanostructures with *w* values of 20 and 40 respectively.

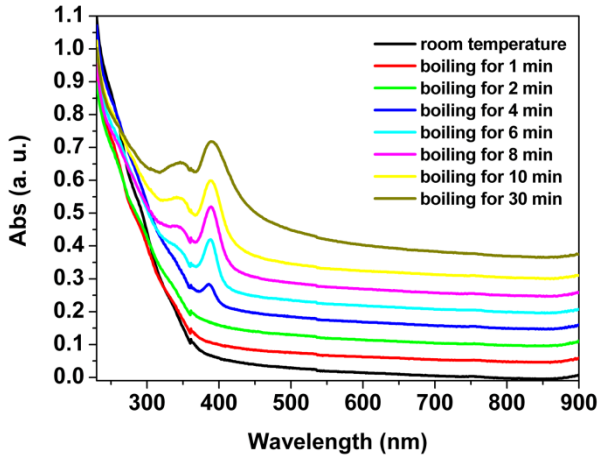

Fig. S5 UV-vis spectroscopic monitoring of the assembly of Au(I)–MPA CPs in microemulsion with *w* value of 20.

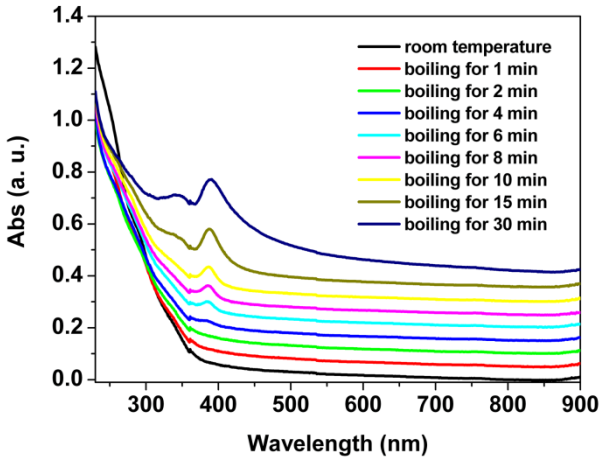

Fig. S6 UV-vis spectroscopic monitoring of the assembly of Au(I)–MPA CPs in microemulsion with *w* value of 40.

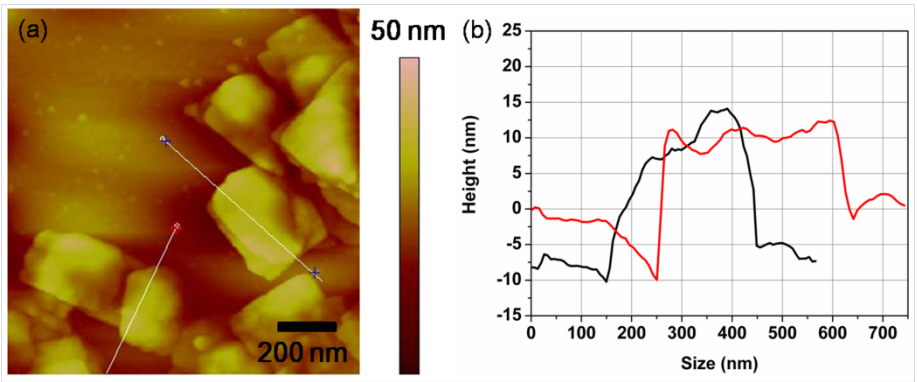

Fig. S7 AFM image and height analysis of M-Au(I)-MPA quasi-square nanosheets.

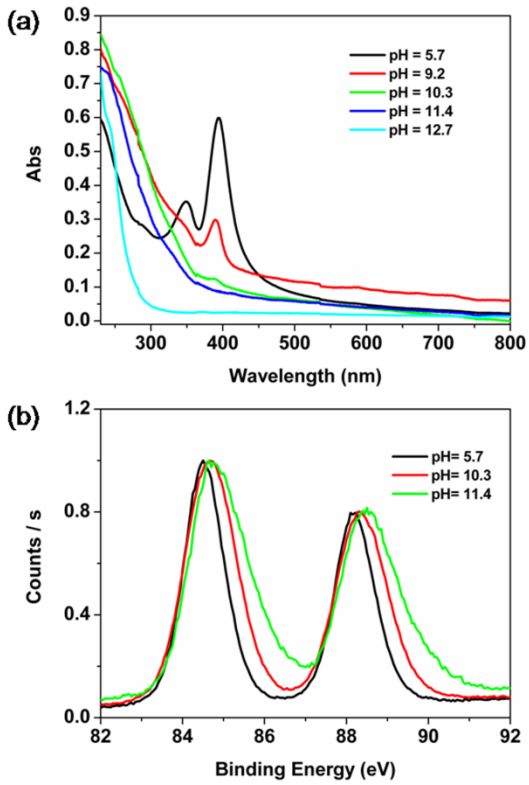

Fig. S8 UV-vis absorption spectra (a) and XPS patterns of Au 4f (b) for M-Au(I)-MPA nanostructures prepared from microemulsion systems with different pH values.

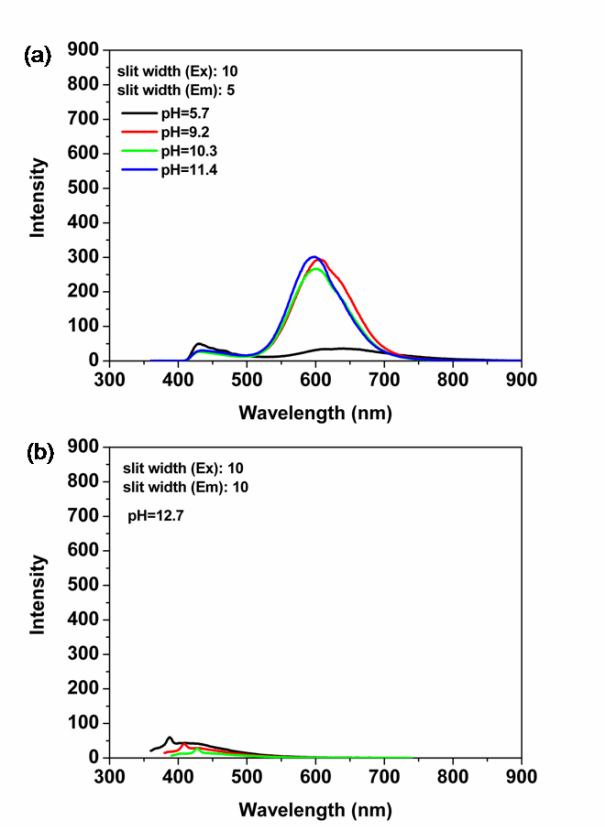

Fig. S9 (a) Photoemission spectra (λ_{ex}=350 nm) of M-Au(I)-MPA nanostructures prepared with MPA-Na with pH values of 5.7, 9.2, 10.3 and 11.4, respectively,

[Au]=5×10^{-4} M, excitation and emission slit widths are 10 and 5. Two emission bands originated from the ligand to metal charge transfer (LMCT) and metal centered charge transfer (MMCT) were observed. (b) Photoemission spectra of Au(I)-MPA nanochips (pH value of MPA-Na reactant is 12.7) with excitation of 347 nm (black), 365 nm (red) and 380 nm (green), respectively, [Au]=5×10^{-4} M, almost no fluorescence peaks was observed at larger excitation and emission slit widths of 10 and 10.

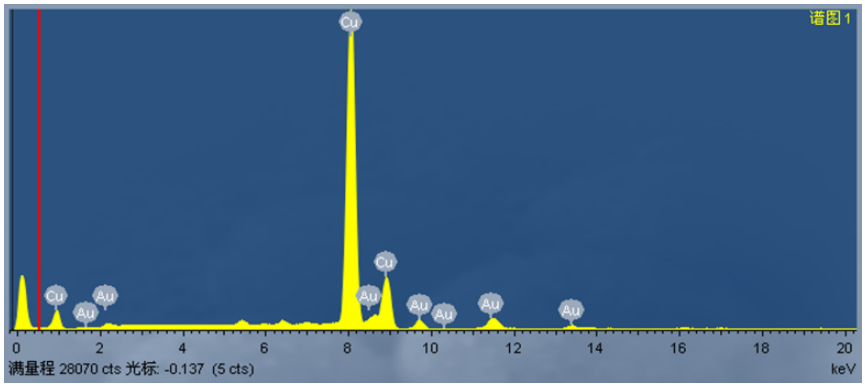

Fig. S10 EDX spectrum of the obtained Au particles. Au peaks were observed in the EDX spectra.

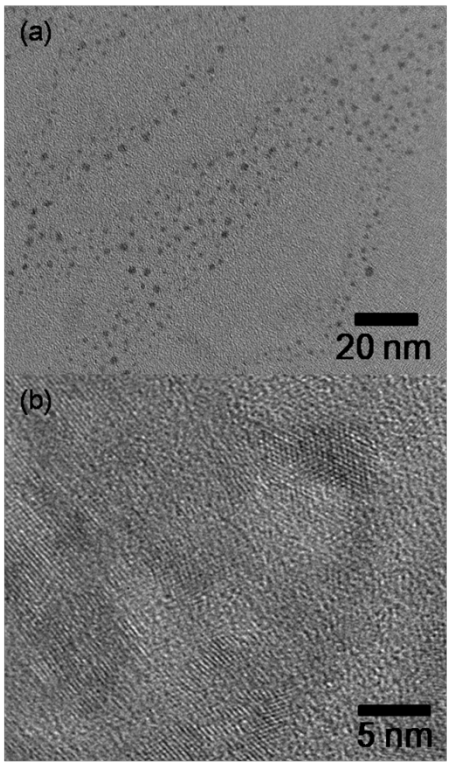

Fig. S11 TEM images of red (a) and blue (b) photoluminescent Au clusters.

Reference

1. C. F. Wu, S. J. Hansen, Q. Hou, J. B. Yu, M. Zeigler, Y. H. Jin, D. R. Burnham, J. D. McNeill, J. M. Olson and D. T. Chiu, *Angew. Chem. Int. Ed.,* 2011, 50, 3430-

3434.