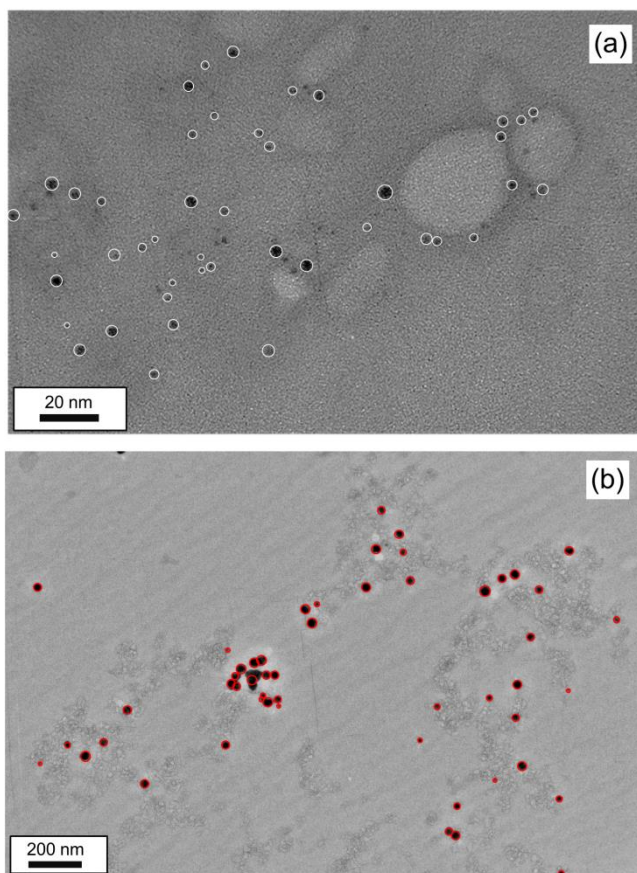


## Supporting Information

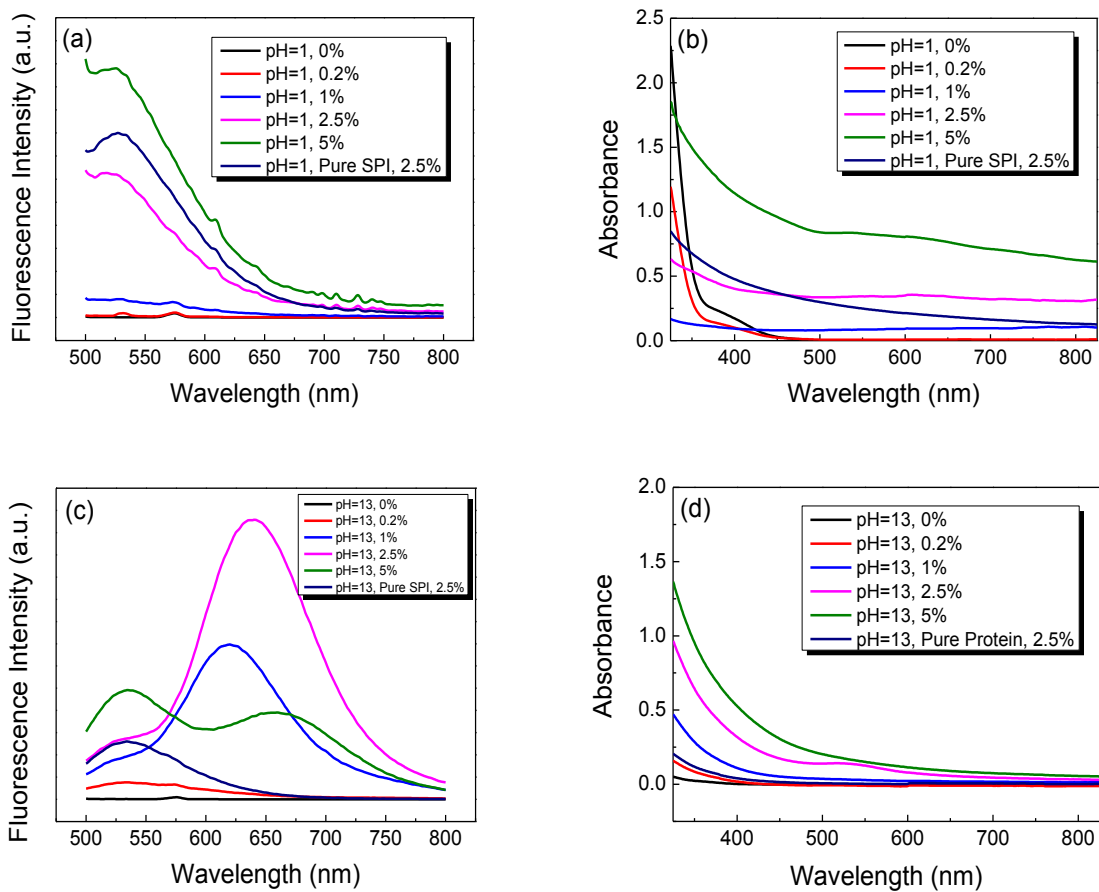
### **Soy protein-directed one-pot synthesis of gold nanomaterials and their functional conductive devices**

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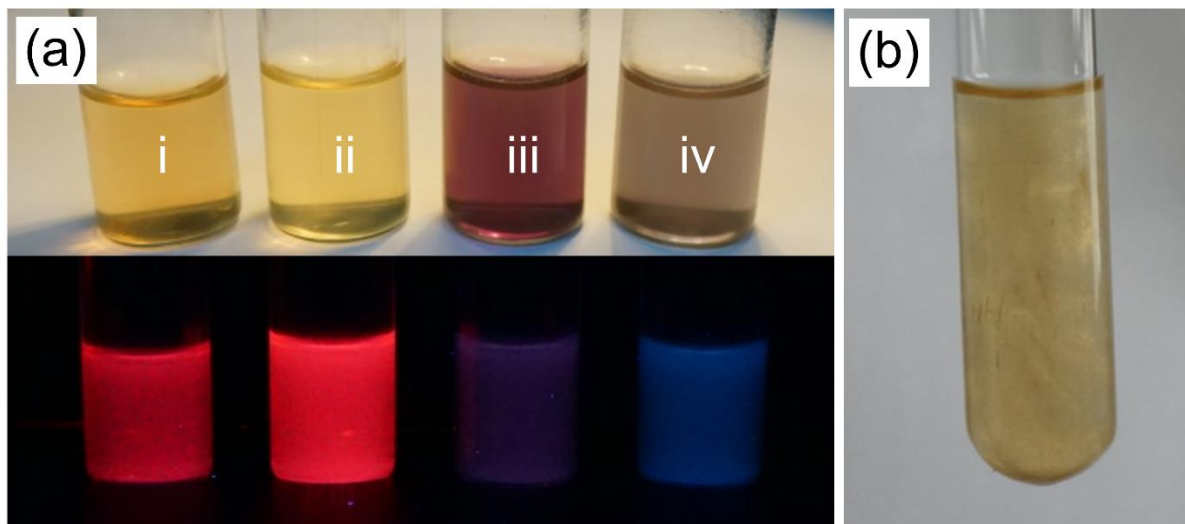
*State Key Laboratory of Molecular Engineering of Polymers, Collaborative Innovation Center of Polymers and Polymer Composite Materials, Department of Macromolecular Science, Laboratory of Advanced Materials, Fudan University, Shanghai, 200433, People's Republic of China. E-mail: chenx@fudan.edu.cn.*



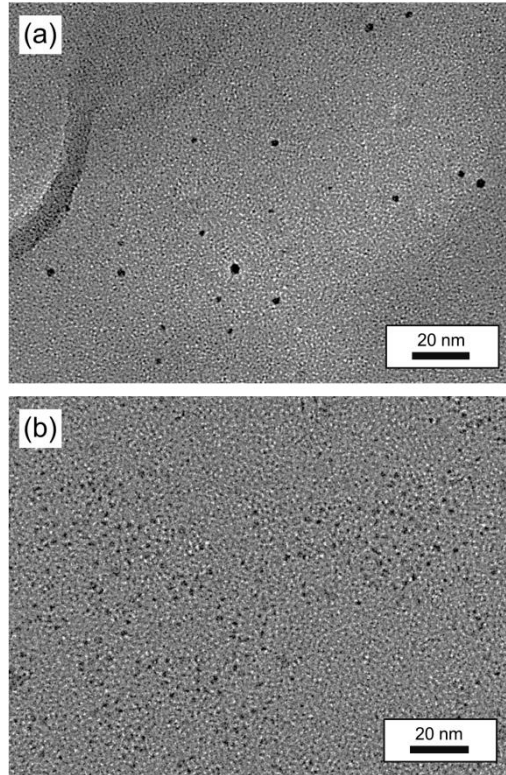
**Fig. S1** FE-TEM image of gold NPs prepared from 2.5 wt% SPI with 5 mmol/L HAuCl<sub>4</sub> at pH 13 with high magnification (a) and low magnification (b).



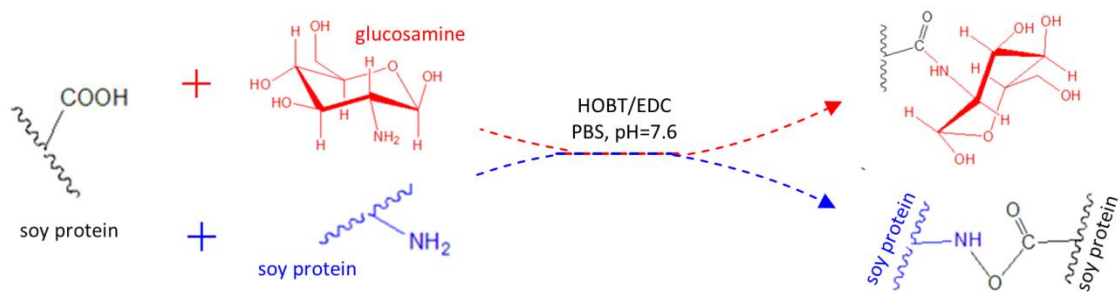
**Fig. S2** Fluorescence spectra (a, c) and UV-vis spectra (b, d) of SPI/gold NMs solution prepared by different SPI concentration at pH 1 (a, b) and at pH 13 (c, d).



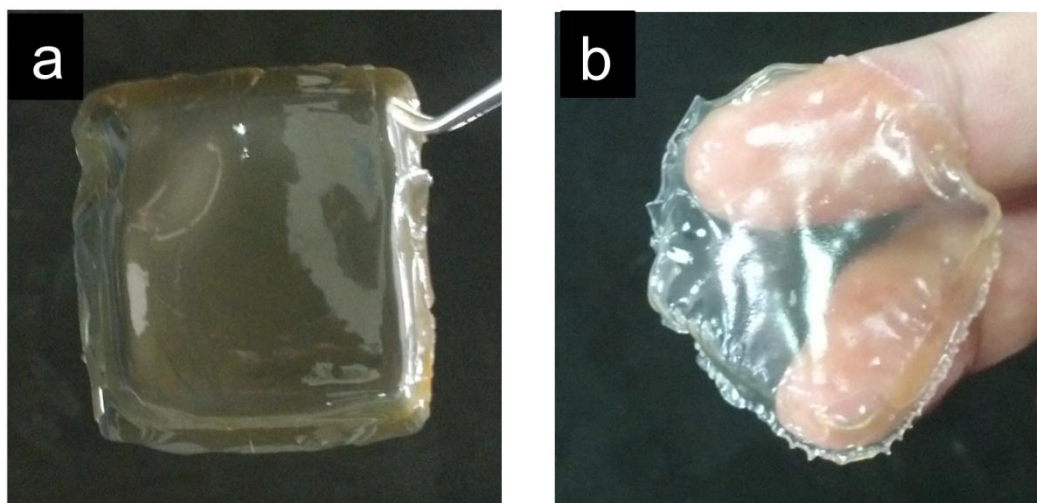
**Fig. S3** Effect of hydrolysis time of SPI on the shape and size of gold NMs. (a) SPI/gold NMs solution obtained with 2.5 wt% pre-hydrolyzed SPI and 5 mmol/L  $\text{HAuCl}_4$  solution under pH 13, incubated at 60 °C for 6 h. Hydrolysis time: (i) 0 h; (ii) 0.5 h; (iii) 3 h; (iv) 6 h. The top and bottom photos are under visible and UV light observation. (b) SPI/gold NSs solution obtained with 1 wt% of 6 h pre-hydrolyzed SPI and 5 mmol/L  $\text{HAuCl}_4$  solution under pH 1 at 60 °C.



**Fig. S4** (a) FE-TEM image of gold NCs prepared from 3 h incubation with 2.5 wt% SPI and 5 mmol/L HAuCl<sub>4</sub> at pH 13; (b) FE-TEM image of gold NCs purified by centrifuging SPI/gold NCs colloidal solution (prepared from 96 h incubation with 2.5 wt% SPI and 5 mmol/L HAuCl<sub>4</sub> at pH 13) at 10000 r/min and 30 min.



**Fig. S5** Chemical modification route of SPI.



**Fig. S6** Photographs of chemical modified SPI film (a) in dry state (50% relative humidity) and (b) in wet state (100% relative humidity).