

Electronic supplementary information

Seed-free, aqueous synthesis of gold nanowires

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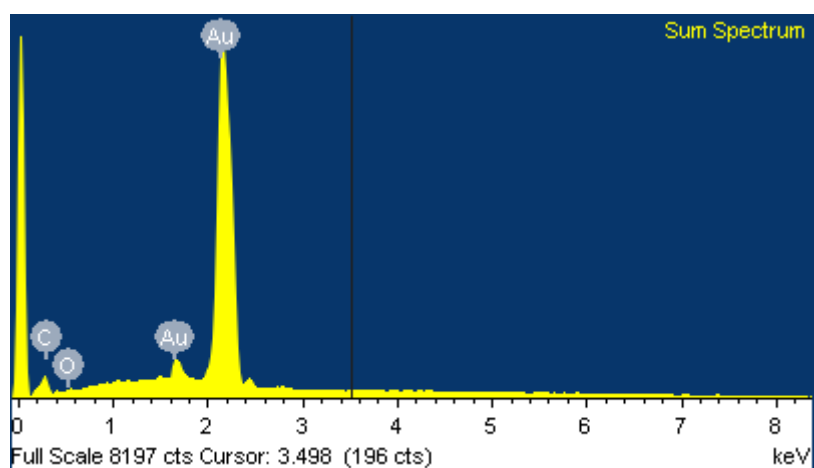
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SI-1. Chemicals:

2-pyrrolidinone (99%, colorless, Alfa Aesar, it is very easy to be oxidized by oxygen and the purity is sensitive to the morphology of products), chloroplatinic acid hexahydrate (99.9%, Sigma-Aldrich), chloroauric acid (99.9% Sigma-Aldrich), poly(vinyl pyrrolidone) (PVP; MW =40 000, K30, Fluka), hydrochloric acid (37%, merck).

SI-2. Characterization

Crystallographic phases of the prepared products were investigated by X-ray power diffraction method (XRD) using Shimadzu XRD-6000 with Cu K α radiation. The morphologies of the as-prepared sample were characterized by a field-emission scanning electron microscopy (FESEM; JSM-6700F), transmission electron microscopy (TEM; JEM-2010, 200 kV), selected area electron diffraction (SAED), and high-resolution transmission electron microscopy (HRTEM; JEM-3010, 300 kV). The reaction solution was analyzed by gas chromatography mass spectrometry (GCMS, Agilent-7890A). The temperature of GC was programmed from 70 to 280°C. Before GC test, solid products were removed by centrifugation and the obtained reaction solution was then diluted by ethanol. Fourier transform infrared (FTIR) spectrum was record for KBr dilute sample using a Bio-Rad FTS-135 FTIR spectrometer. Thermogravimetric analysis (TGA; Shimadzu TGA-50) was also performed to determinate component of the sample. The TGA measurements were carried out at a heating rate of 10 °C /min from 50 °C to 800 °C with an air flowrate of 100 mL/min.



Spectrum processing :
No peaks omitted
Processing option : All elements analyzed (Normalised)
Number of iterations = 2
Standard :
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Au Au 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	9.49	57.6
O K	2.12	9.67
Au M	88.39	32.73
Totals	100.00	

Figure S1. EDX spectrum of as-prepared gold nanowires.

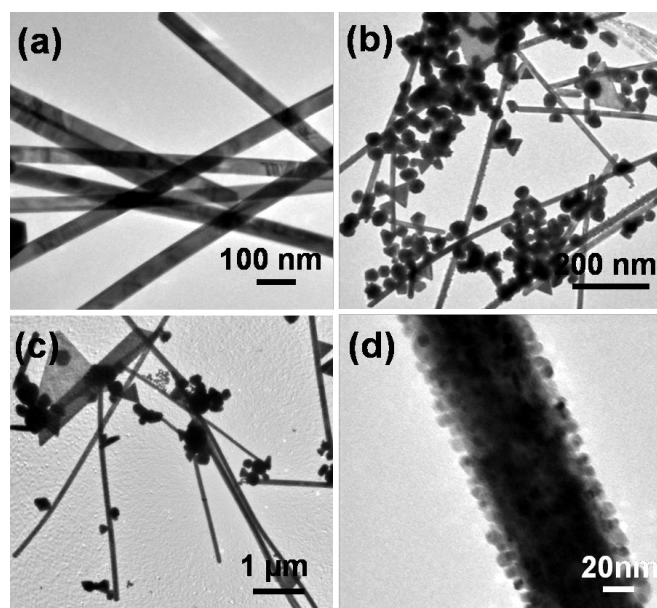


Figure S2. TEM images of gold nanostructures synthesized at different temperatures: (a) 120 °C, (b) 140 °C, (c, d) 180 °C.

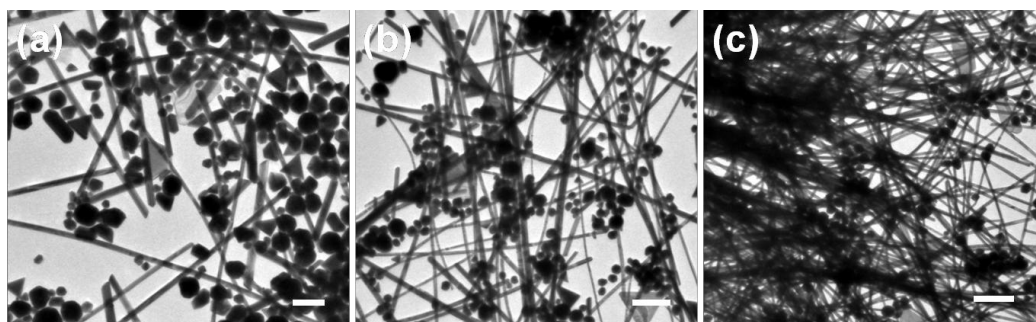


Figure S3. TEM images of gold nanostructures synthesized by different PtCl_6^{2-} concentration: (a) 0.5 mL, (b) 1 mL, (c) 4 mL. Scale bar: (a) 200 nm, (b) 400 nm, (c) 500 nm.

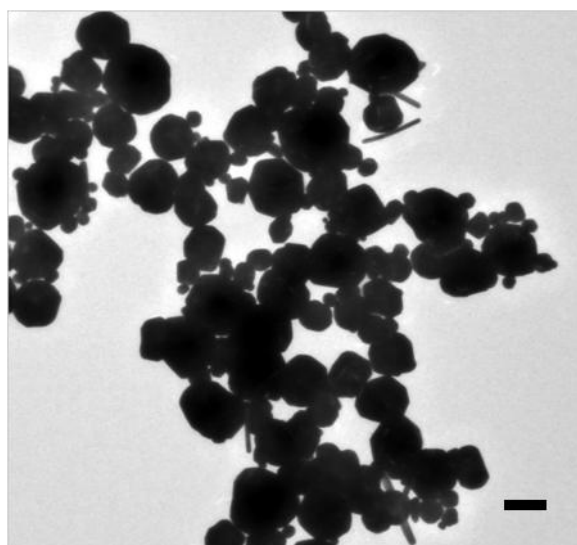


Figure S4. TEM images of gold nanostructures prepared in the absence of PVP.

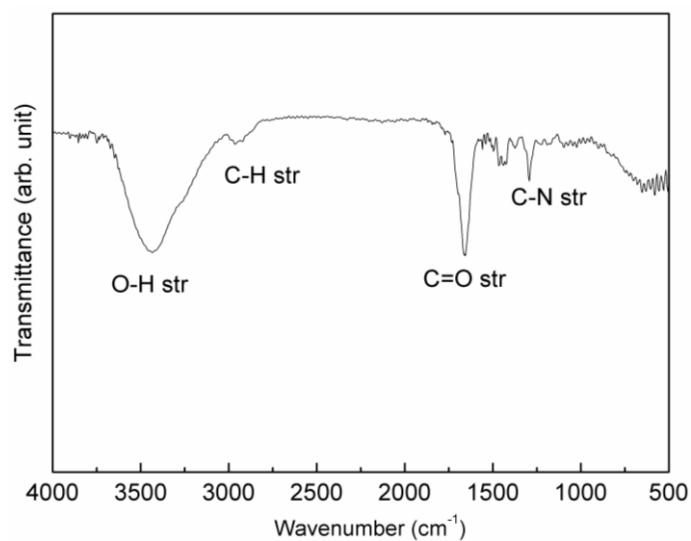


Figure S5. A typical FTIR spectrum of gold nanowires. The band at 3440 cm⁻¹ is assigned to the stretching vibration of the O-H group of molecular water. The rest peaks observed at 2950, 1663 cm⁻¹ and 1289 cm⁻¹ are attributed to stretching vibration of C-H, C=O and C-N, respectively. All these peaks indicate that 2-pyrrolidinone exist in the product.

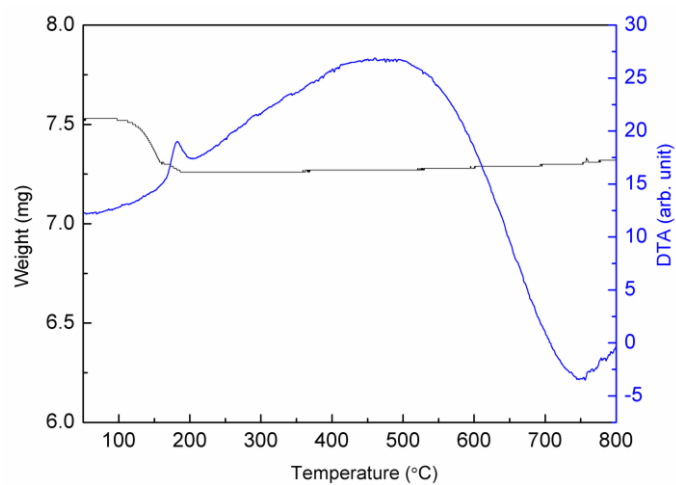
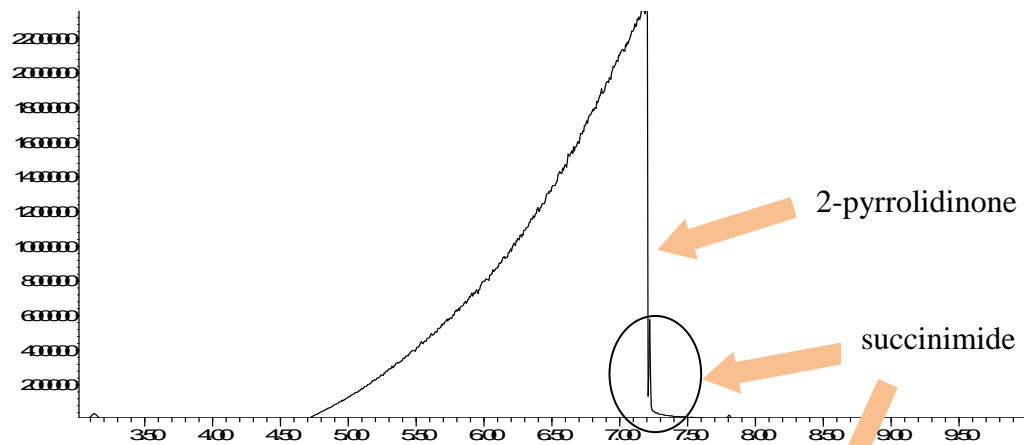


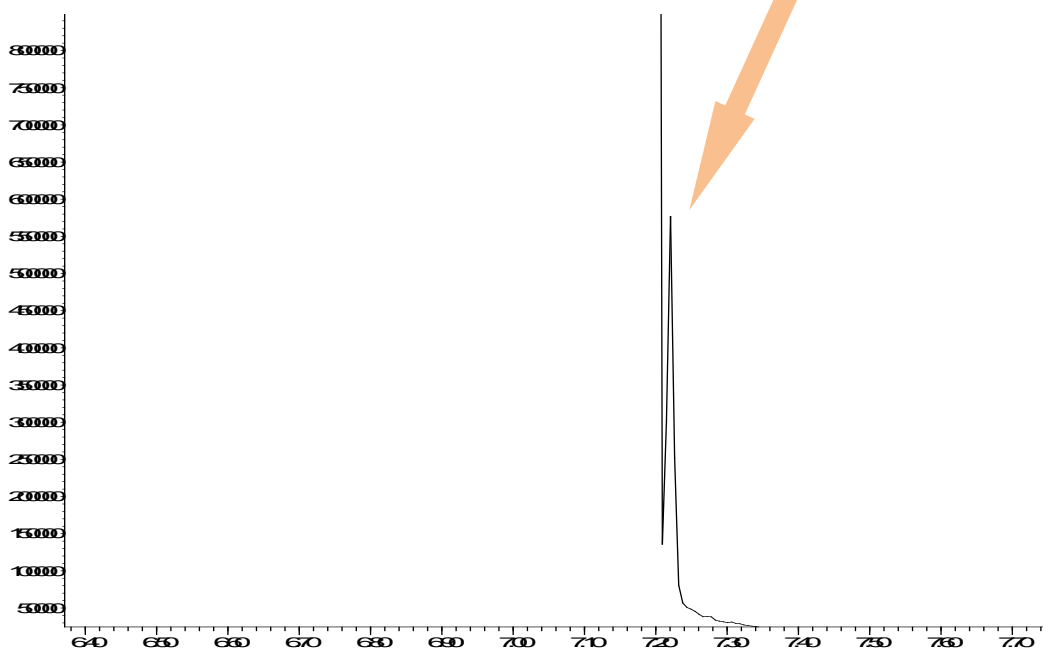
Figure S6. Thermogravimetric analysis curves of gold nanowires. The weight loss at around 150 °C can be attributed to the evaporation of 2-pyrrolidinone.

SI-3: GCMS results of reaction solution.

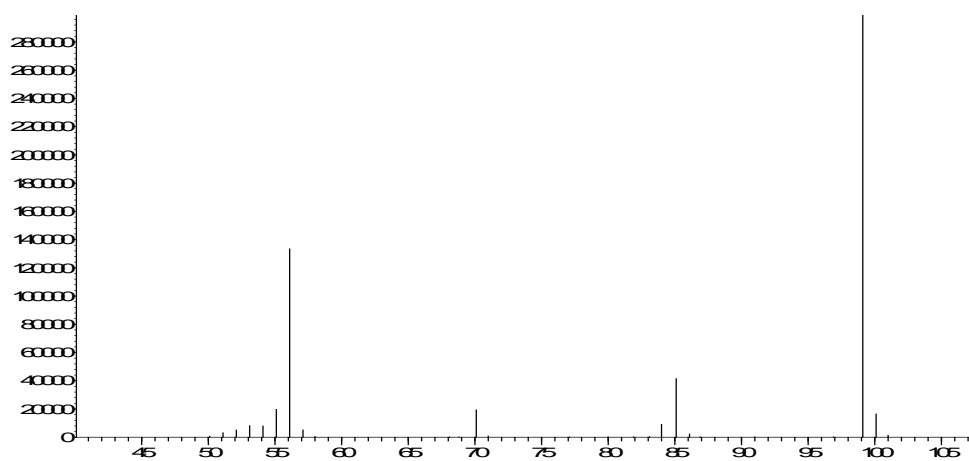
(1) GC analysis results



(2) Enlarged GC analysis results



(3) Mass spectrometry of succinimide



(4) Mass spectrometry of succinimide

