

Supplementary Information

**Synthesis of silver nanoplates at high yields by slowing down the  
polyol reduction of silver nitrate with polyacrylamide**

**Yujie Xiong,<sup>a,+</sup> Andrew R. Siekkinen,<sup>a,+</sup> Jinguo Wang,<sup>b</sup>  
Yadong Yin,<sup>c</sup> Moon J. Kim,<sup>b</sup> and Younan Xia<sup>a,\*</sup>**

*<sup>a</sup>Department of Chemistry, University of Washington, Seattle, Washington 98195, USA*

*<sup>b</sup>Department of Electrical Engineering, University of Texas at Dallas, Richardson, Texas 75083, USA*

*<sup>c</sup>Department of Chemistry, University of California, Riverside, California 92521, USA*

*<sup>+</sup>These two authors contributed equally to this work.*

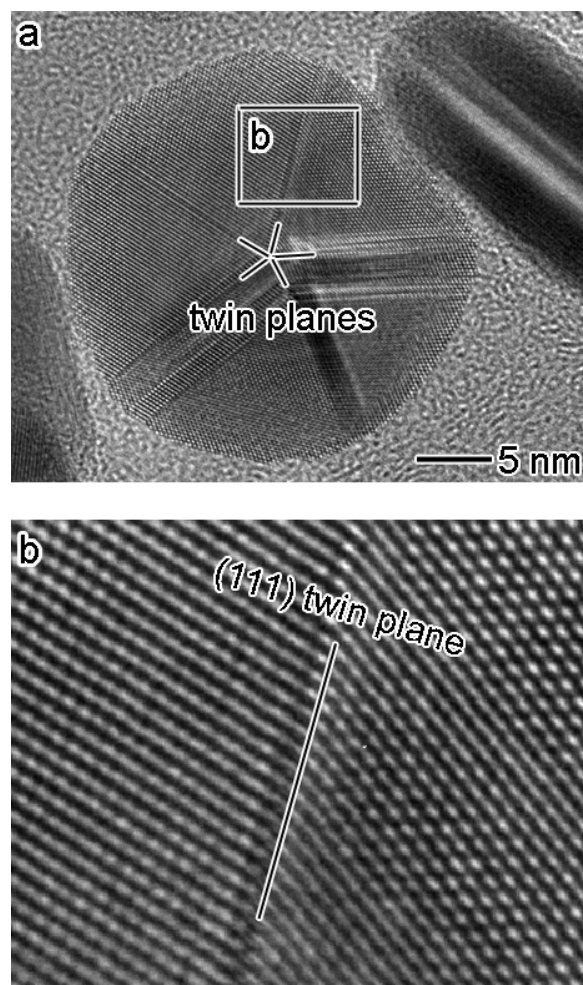
*\*Corresponding author. E-mail: xia@chem.washington.edu*

**Experimental Procedure:**

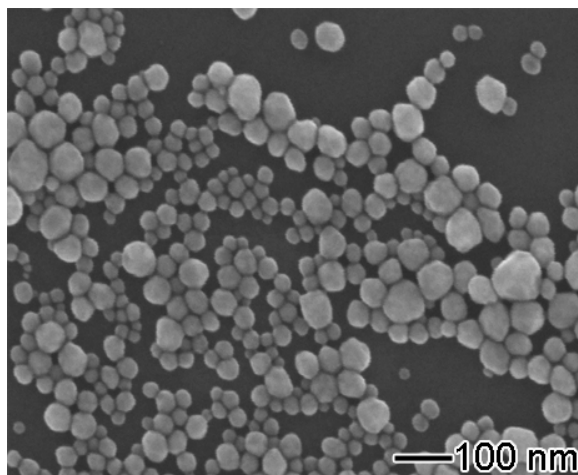
In a typical synthesis, 5.00 mL of ethylene glycol (EG, J. T. Baker, 9300-01) was hosted in a 20-mL vial (liquid scintillation vial, with a white cap and polyethylene liner, Research Products International, Chicago, IL), and heated in air under magnetic stirring at 135 °C for 1 h. At the same time, 0.024 g of AgNO<sub>3</sub> (Aldrich, 209139-25G) was dissolved in 0.50 mL of EG and 0.17 mL of PAM (Aldrich, 43494-9, M.W.=10,000, 50 wt.% solution in water) was mixed with 0.33 mL of EG at room temperature. These two solutions were then added simultaneously into the vial using glass pipettes. After the vial had been capped, the reaction was allowed to proceed at 135 °C for 3 h. The product was collected by centrifugation and washed with water three times to remove EG and excess PAM.

**Instrumentation:**

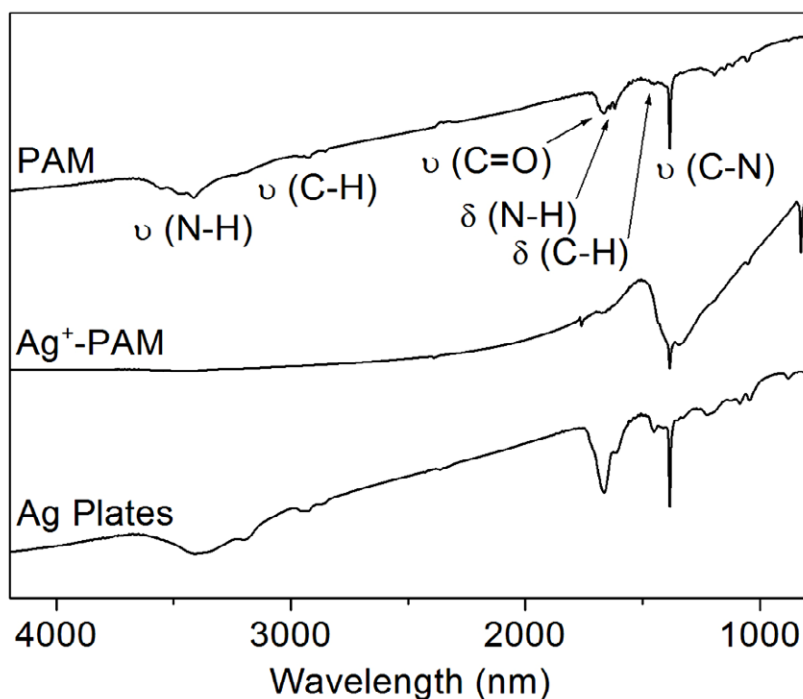
TEM images were captured using a Phillips 420 transmission electron microscope operated at 120 kV. High-resolution TEM images were taken on a JEOL 2100F field-emission microscope or a JEOL 2010 LaB6 high-resolution microscope operated at 200 kV. SEM images were taken on a FEI field-emission microscope (Sirion XL) operated at an accelerating voltage of 20 kV. Samples for TEM and SEM studies were prepared by drying a drop of the aqueous suspension of nanoparticles on carbon-coated copper grids (Ted Pella, Redding, CA) or silicon wafers under ambient conditions. FT-IR spectra were collected with a Bruker Vector 33 IR spectrometer. FT-IR samples were prepared by drop casting samples on KBr pellets, followed by drying in vacuum. UV-vis absorption spectra were recorded at room temperature on a Varian Cary 5E spectrophotometer using polymethacrylate cuvettes (Fisher Scientific, Pittsburgh, PA) with an optical path of 1 cm.



**Fig. S1.** High-resolution TEM images of a five-fold twinned particle in the sample shown in Fig. 1. The particle had a decahedral shape, with five twin planes on the surface.



**Fig. S2.** SEM image of the sample prepared under the same condition as in Fig. 1 except the use of poly(vinyl pyrrolidone) (PVP, M.W.=55,000) instead of PAM. Although PVP can also serve as a steric stabilizer like PAM for silver colloids, the product consists of irregular MTPs instead of nanoplates. This result implies that the PAM played a vital role in the formation of silver nanoplates.



**Fig. S3.** FT-IR spectra taken from a pure PAM liquid, a solution containing both AgNO<sub>3</sub> and PAM, and the as-synthesized Ag nanoplates. For the spectrum from a solution containing both AgNO<sub>3</sub> and PAM, the N-H stretching band at 3415 cm<sup>-1</sup> is extremely weak as compared to that of pure PAM. In addition, there is a peak at 1340 cm<sup>-1</sup> that can be indexed to the C-N stretching mode red-shifted from 1384 cm<sup>-1</sup>. These changes are most likely related to the formation of coordination complexes between the amino groups of PAM and silver ions. The FT-IR spectrum from the Ag nanoplates shows the presence of PAM on their surface, confirming the additional role of PAM as a stabilizer.