

1 **Supporting information for:**

2 **Impacts of Surfactants on Dissolution and Sulfidation of Silver Nanowires in**
3 **Aquatic Environments**

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16 Summary

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23 **Synthesis and characterization of AgNWs.**

24 AgNWs were synthesized with slight modifications to the solvothermal method. Briefly, 32 mg
25 NaCl and 3.1 g PVP were dissolved in 28 mL of EG. 0.5 g AgNO₃ was dissolved in 42 mL of EG in
26 dark. Then the mixed solution of PVP/NaCl/EG was injected to the AgNO₃/EG solution drop by drop
27 under vigorous stirring. The mixture solution was kept at 120 °C for 10 min, and was transferred to a
28 polytetrafluoroethylene (PTFE) autoclave and kept at 160 °C for 7 h. Finally, the PTFE autoclave was
29 cooled to room temperature. The AgNWs products were washed with ethanol and then ultrapure water
30 by centrifugal ultrafiltration (Amicon Ultra-15 30kD, Millipore, MA) at 2050 g for 20 min. The
31 washing process was repeated twice. The stock suspension of AgNWs was stored at 4 °C in dark for
32 later use.

33 The XRD pattern of the prepared AgNWs are shown in Figure S8A. All peaks can be readily
34 indexed to cubic-phase Ag (ICDD file: 87-0717). The prominent diffraction peaks from the (111) and
35 (200) planes, as well as the remaining features, were consistent with those observed for AgNWs in
36 other studies.^{1,2} The result indicated that the silver nanowires were finely crystallized. The bright-field
37 TEM images of the as-prepared AgNWs are shown in Figure S8B. The nanowires were 2~3 μm in
38 length and about 40 nm in diameter. The nanowires exhibited fivefold-twinned structures constructed
39 by five (200) wall-planes and two spear-like ends around the five (111) planes. This supported the
40 preferred growth of (111) planes, and was consistent with the XRD results reported previously.^{2,3} The
41 XRD and TEM results demonstrated the AgNWs were successfully synthesized.

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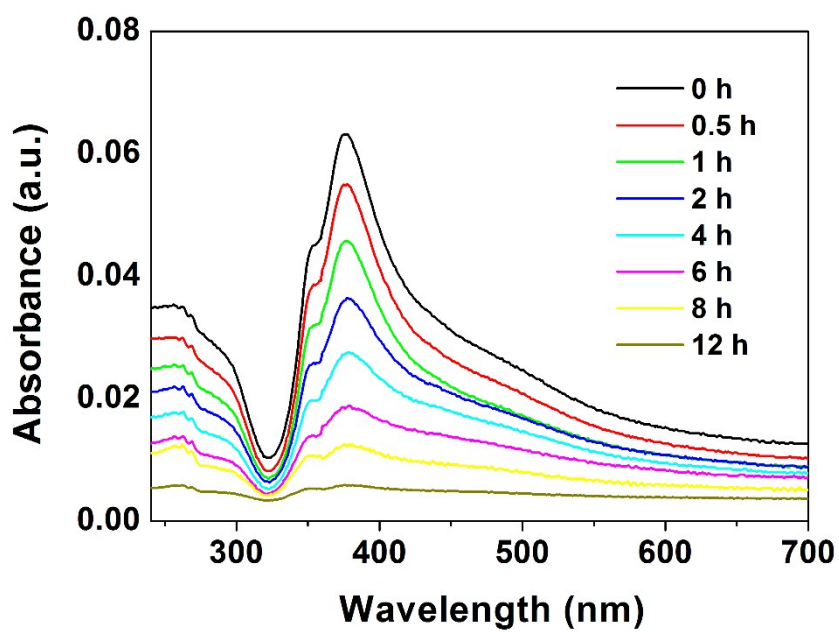
Table S1. Binding Energies of AgNWs and the Sulfidized Products

Sample	Binding Energy (eV)						
	C 1s	N 1s	O 1s	Ag 3d _{5/2}	Ag 3d _{3/2}	S 2p _{3/2}	S 2p _{1/2}
AgNWs	284.8	399.8	531.9	368.2	374.2		
	285.6		532.8				
	287.9						
Sulfidized products in water	284.8	399.9	531.9	368.0	373.9	161.1	162.1
	285.5		533.2				
	288.3						
Sulfidized products in CTAB solution	284.8	400.0	531.9	367.9	373.9	161.2	162.2
	285.6		533.4				
	288.6						

45 **Table S2.** The specific surface areas of the dissolution products of AgNWs in different surfactants
46 solution at 2 h.

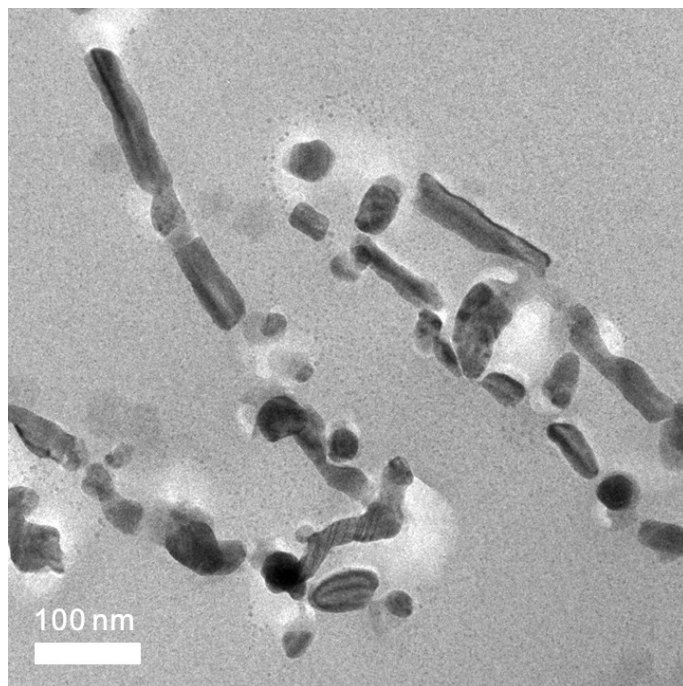
Media of AgNWs dissolution	Surface area (m ² /g)
water	9.9
1.0 μM SDBS	10.2
1.0 μM CB	10.9
1.0 μM GMS	10.4
0.3 μM CTAN	13.2
1.0 μM CTAN	13.7
3.0 μM CTAN	14.3
1.0 μM BDDAN	13.8

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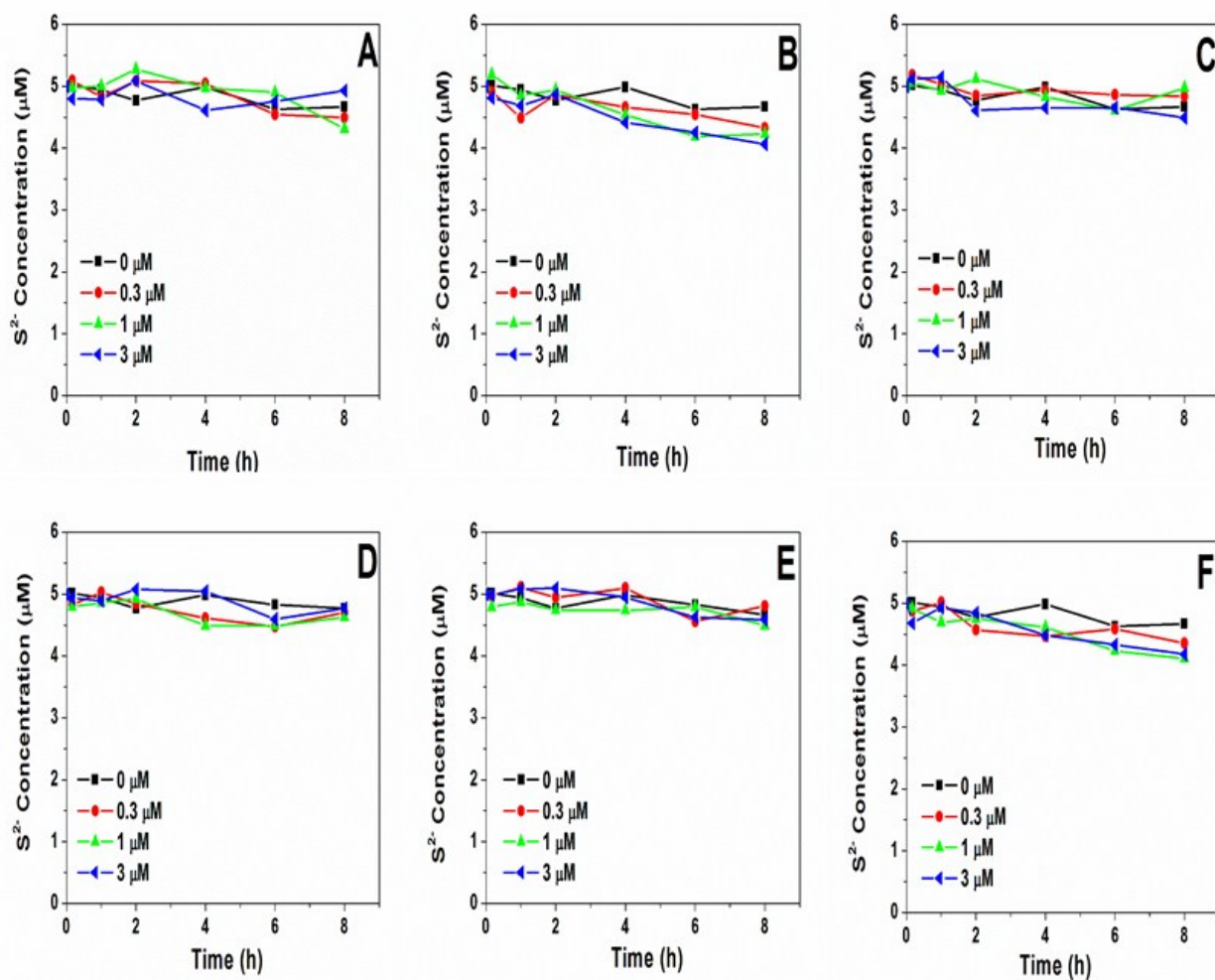
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49 **Figure S1.** UV-Vis absorption spectra of AgNWs dispersed in 1.0 μM CTAB at different reaction
50 times.



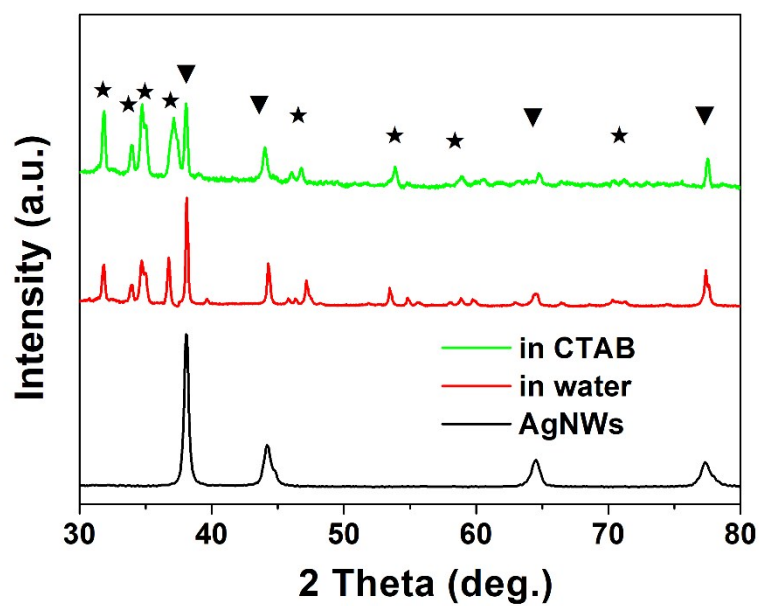
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52 **Figure S2.** TEM image of AgNWs dispersed in BDDAN solution ($1.0 \mu\text{M}$) under sunlight irradiation
53 for 30 min. The scale bar of the image represents 100 nm.



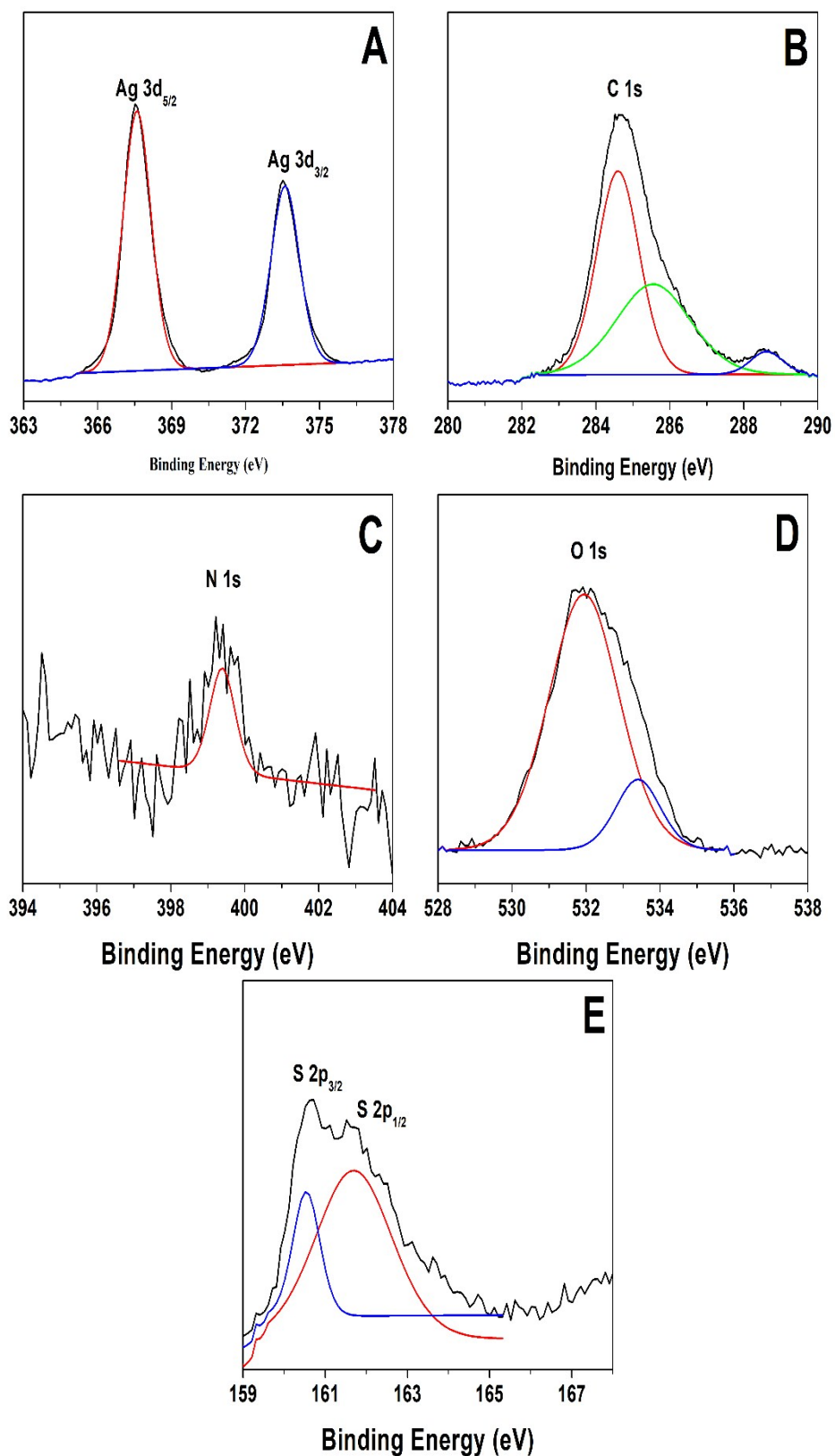
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55 **Figure S3.** Decrease of soluble sulfide concentration in different surfactant solutions at different
 56 concentrations in the absence of AgNWs. (A) SDBS, (B), CB (C) GMS, (D) CTAB, (E) CTAN, and
 57 (F) BDDAN. Data points represent the average of three independent replicates.



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60 **Figure S4.** XRD patterns of AgNWs and the products of AgNWs sulfidation at 2 h in water and in
61 CTAB solution, respectively. The diffraction peaks labeled by ▼ can be attributed to the crystalline
62 Ag⁰ nanowires, and the peaks labeled by ★ can be attributed to Ag₂S.



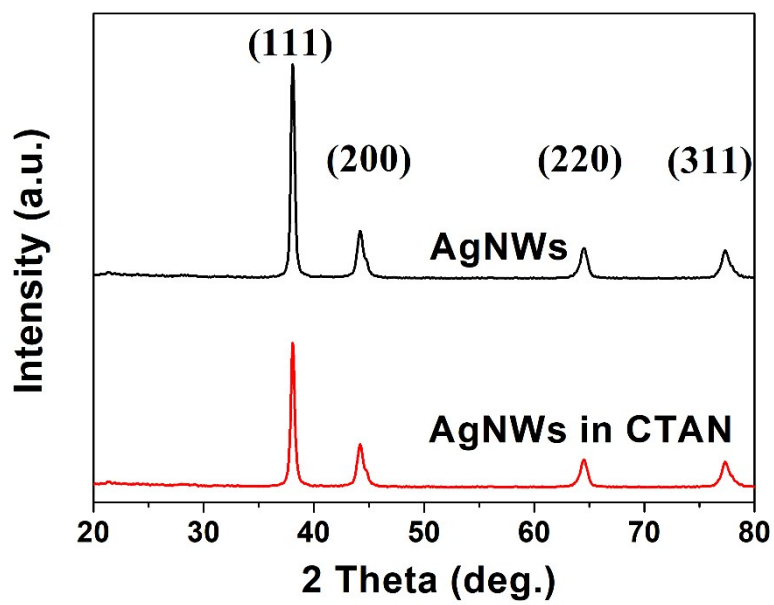
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66 **Figure S5.** XPS spectra of the sulfidized products in CTAB solution. (A) Ag 3d_{5/2} and Ag 3d_{3/2} spectra.

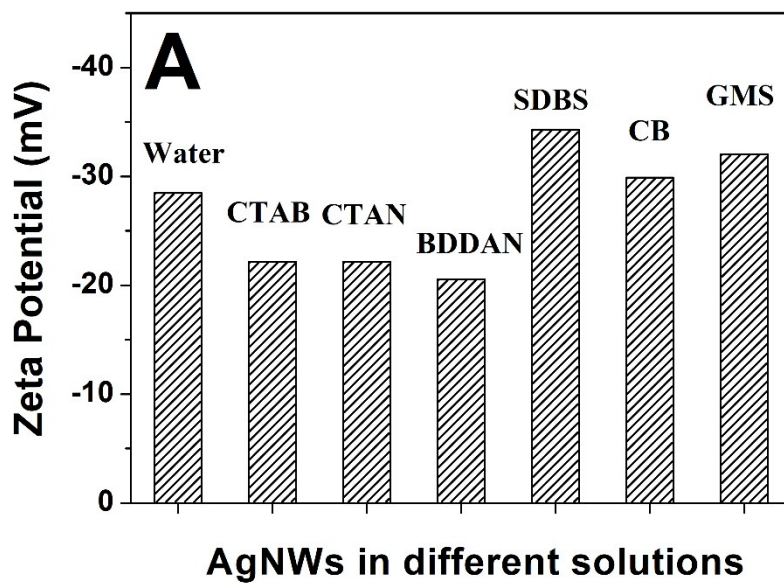
67 (B) C 1s spectrum. (C) N 1s spectrum. (D) O 1s spectrum. (E) S 2p_{3/2} and S 2p_{1/2} spectra.



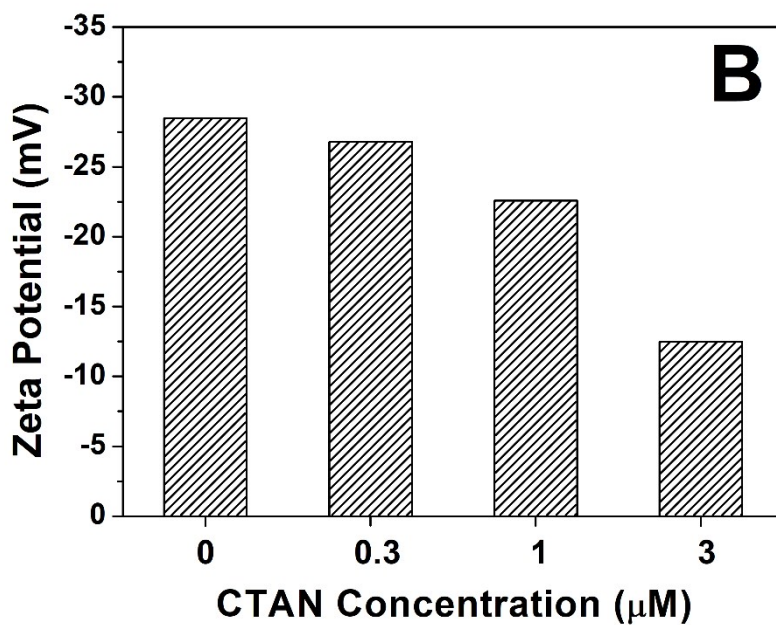
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69 **Figure S6.** XRD pattern of the original AgNWs and AgNWs dispersed in CTAN solution (1 μM)

70 under sunlight irradiation for 2 h.



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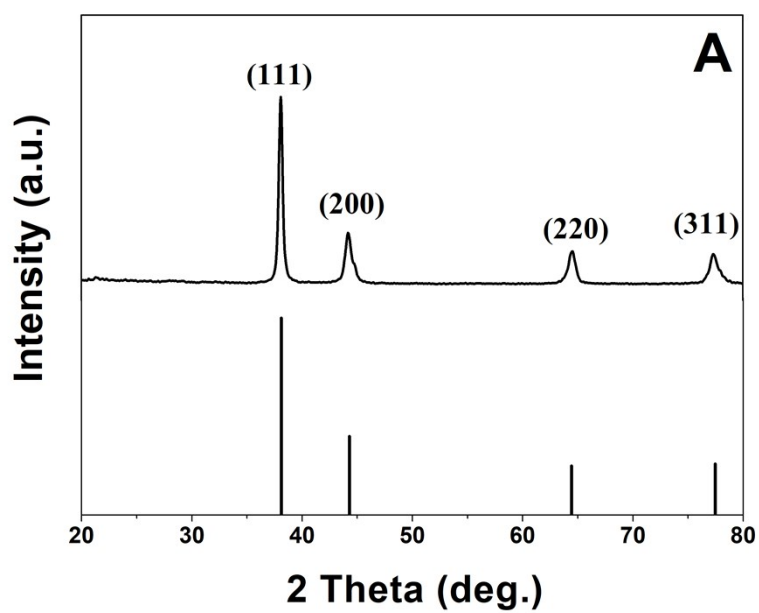


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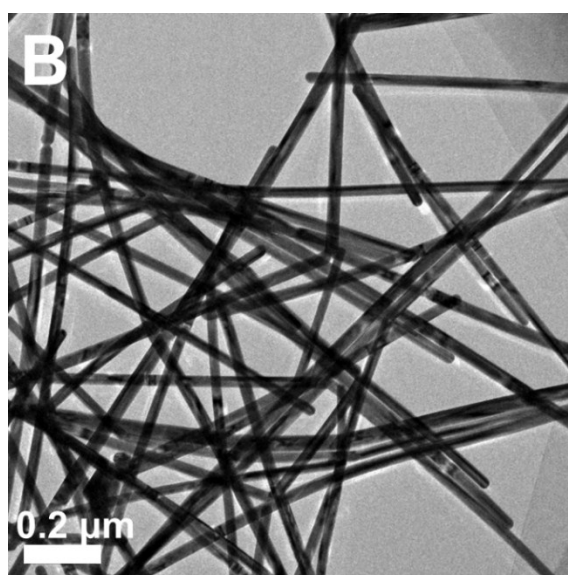
73 **Figure S7.** Zeta potential of AgNWs in different solution. (A) AgNWs in different surfactants solution.

74 The concentration of each surfactant was 1 μM ; (B) AgNWs in CTAN solutions at different

75 concentrations.



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78 **Figure S8.** Characterization of as-synthesized AgNWs. (A) XRD pattern of the as-prepared AgNWs;

79 (B) Bright-field TEM image of AgNWs. The scale bar of the image represents 200 nm.

80 References

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