Supporting Information

S1. Synthesis of Ag NWs. Ag NWs with the aspect ratio of ~ 100 were synthesized by the reduction of silver nitrate in the presence of PVP in EG according to the references.[14]

Briefly, 20 mL of EG was refluxed in a three-necked round-bottom flask at 160 ℃ for 1 h. Then, 10 mL $AgNO_3$ solution in EG (0.2 M) and 10 mL PVP solution in EG (0.3 M) were simultaneously injected into the refluxing solvent at a rate of approximately 0.4 mL min^{-1}. After the solution turned to gray, the reaction mixture was further refluxed at 160 ℃ for 1 h. The whole process was accompanied with magnetic stirring. The reaction mixture was centrifuged at 3500 rpm and washed with ethanol to remove excessive PVP, EG and the formed small nanoparticles (NPs). The obtained Ag NWs were dispersed in ethanol for the following reaction.

S2. Synthesis of ZnO seed. ZnO sol-gel solution was prepared as reported previously.[32] 125 mL zinc acetate dehydrate solution in methanol (0.01 M) was prepared under vigorous stirring at 60 ℃. Then, 65 mL KOH solution in methanol (0.03 M) was injected dropwise into the above solution. The sol-gel solution of ZnO seeds was obtained after continuous stirring at 60 ℃ for 2 h.

S3. Synthesis of ZnO NS-grown Ag NWs. The Substrate covered with ZnO seed-coated Ag NWs was directly immersed into the growth solution of ZnO BNRs and incubated at 95 ℃ for 14 h to complete the preparation.

S4. Synthesis of ZnO NR arrays and ZnO NS arrays on coverslips. The ZnO seed-coated coverslips were immersed in the same nutrients for the growth of ZnO NR-grown Ag NWs and ZnO NS-grown Ag NWs at 95 ℃ for 6 h and 14 h, respectively. Then the samples were taken out for subsequent cleaning.

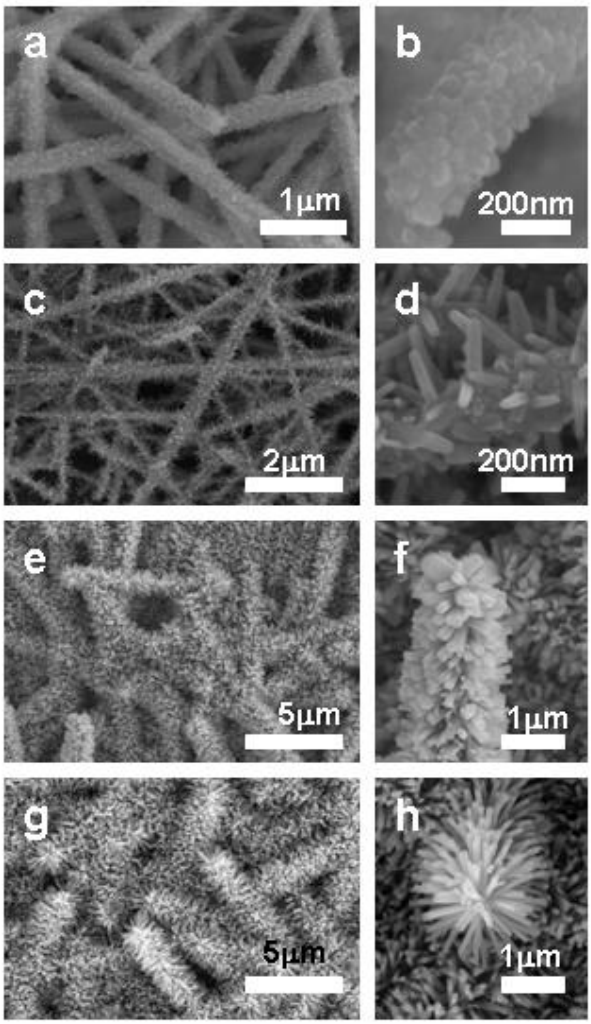

Figure S1. SEM images of the ZnO NR-grown Ag NWs prepared from 0.05 M $Zn(NO_3)_2$ and 0.05 M HMT at 95 ^{0}C for different time: (a,b) 0.5 h; (c,d) 1 h; (e.f) 3 h; (g,h) 6 h.

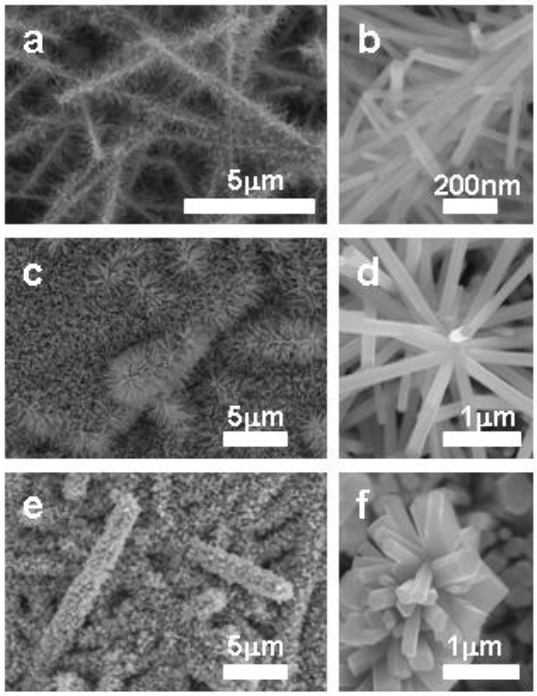

Figure S2. SEM images of the as-prepared ZnO NR-grown Ag NWs from different equimolar concentrations of $Zn(NO_3)_2$ and HMT for 6 h: a,b) 0.01 M; c,d) 0.025 M; e,f) 0.1 M.

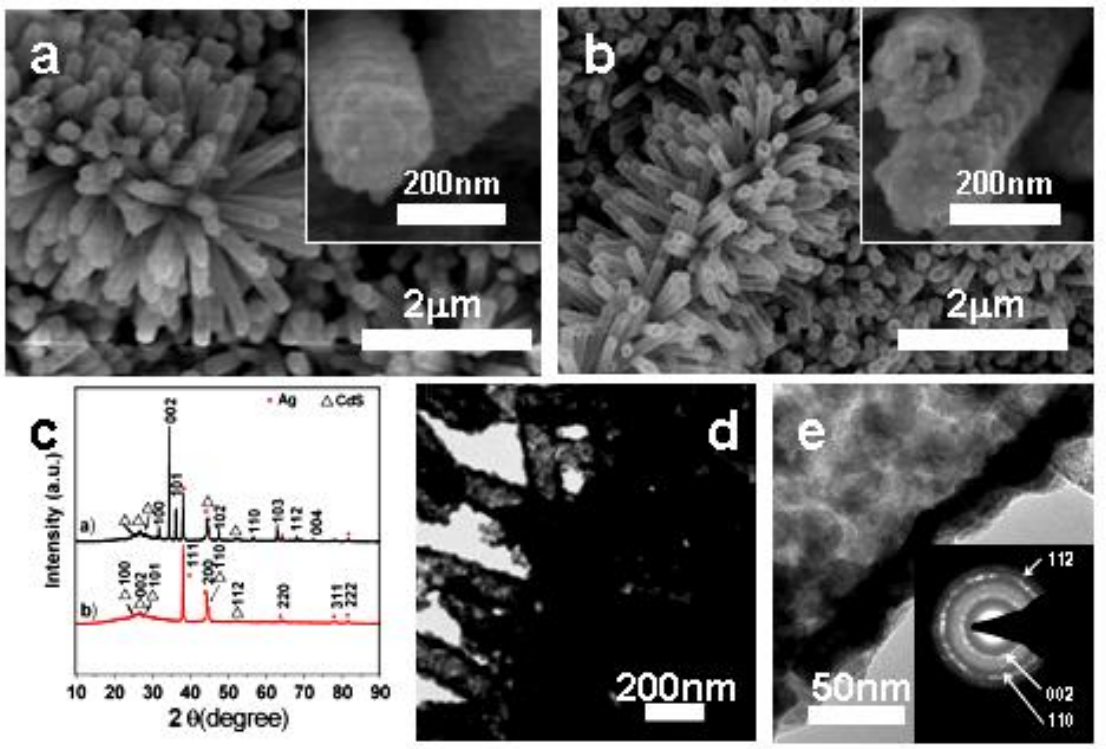

Figure S3. SEM (a,b) and TEM (d,e) images of the resulting CdS/ZnO NR-grown Ag NWs (a) and CdS NT-grown Ag NWs (b, d, e). Panel c shows the corresponding XRD patterns of CdS/ZnO NR-grown Ag NWs before (curve a) and after (curve b) selective dissolution of the ZnO NRs. Insets in a, b and e are the corresponding high magnification and the SAED pattern, respectively.

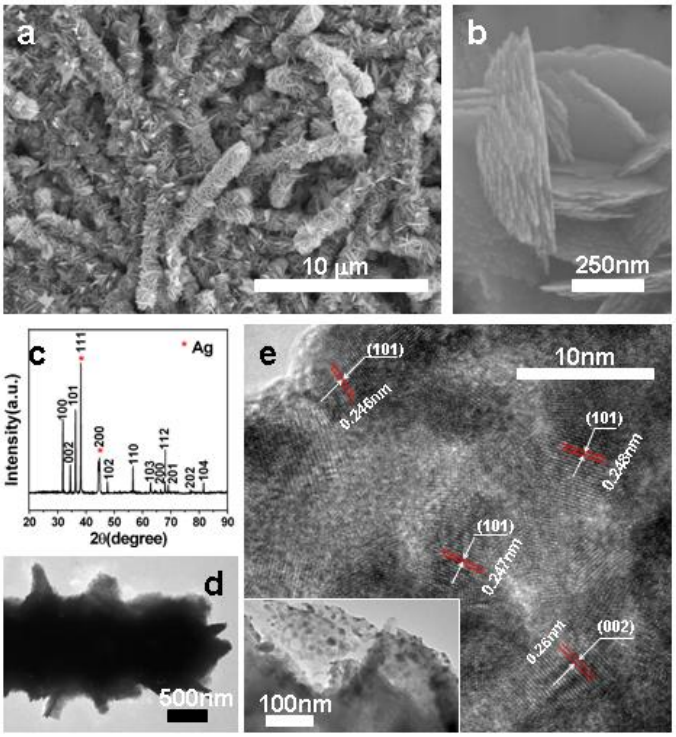

Figure S4. SEM (a,b), TEM (d) and HRTEM (e) images of the as-prepared ZnO NS-grown Ag NWs. Panel c shows the corresponding XRD pattern. The corresponding XRD pattern confirms the co-existence of fcc Ag (marked with stars) and wurtzite ZnO (c). Apart from the (002) diffraction peak, the presence of strong (100) and (101) peaks that are well attributed to wurtzite ZnO implies that (100) and (101) ZnO planes are parallel to the substrate, indicating the nanosheet is enclosed by the ±(001) and (1-10) planes as the top/bottom and side surfaces, respectively. The measured inter-plane spacing of ~ 0.26 nm and 0.247 nm in TEM (e) matches well with the (002) and (101) planes of wurtzite ZnO, respectively.