Supporting Information for:

Controllable Conversion of Plasmonic Cu_{2-x}S Nanoparticles to Au₂S by Cation Exchange and Electron Beam Induced Transformation of Cu_{2-x}S/Au₂S Core/Shell Nanostructures

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Part I. Size Distributions

Figure S1. Size distribution of (a) $Cu_{2-x}S$ NCs used as templates, (b) $Cu_{2-x}S$ -Au₂S NCs produced by cation exchange using 0.056 mmol Au precursor, and (c) Au₂S NCs produced by cation exchange using 0.3 mmol Au precursor. The average sizes of these NCs are 8.0 nm, 8.3 nm and 9.1 nm, respectively.





Figure S2. The XRD pattern of the template NCs can be fit well as a mixture of the covellite and high chalcocite (digenite) phases, both of which have hexagonal P63/mmc symmetry. The above fit corresponds to about 89% covellite and 11% high chalcocite content. Fitted lattice parameters were a = 3.764 Å, c = 7.058 Å for the high chalcocite phase and a = 3.805 Å, c = 15.884 Å for the covellite phase. Reitveld refinement was carried out using the MAUD program (http://www.ing.unitn.it/~maud/).

Part III. Selected Area Electron Diffraction (SAED) Patterns:



Figure S3.(a) SAED pattern of the $Cu_{2-x}S-Au_2S$ NCs produced by cation exchange using 0.056 mmol Au precursor, (b) SAED pattern of pure Au_2S particles after cation exchange process by using 0.300 mmol Au precursor. In (a), the diffraction ring labelled (110) is attributed to diffraction from $Cu_{2-x}S$, while the (111) and (200) rings are attributed to Au_2S .