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ESI

Bimetallic core-shell nanocomposites using weak reducing agent and their transformation to alloy nanostructures

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Figure S1. Characterization of Ag nanoparticles prepared using $AgNO_3$ as metal precursor and *dry* THF as solvent: a) UV-visible spectrum; b) TEM BF image; c) SAED pattern; d) powder XRD pattern; e) XPS spectrum

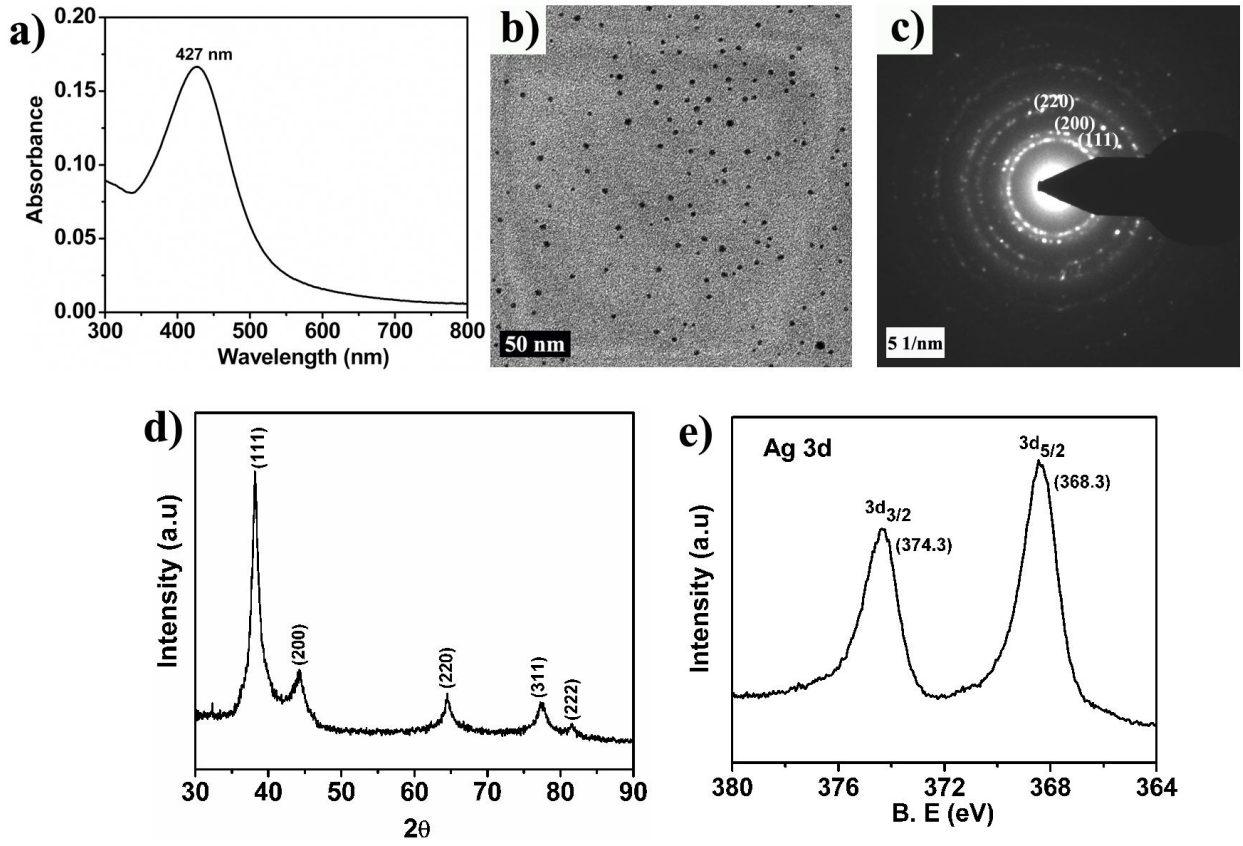

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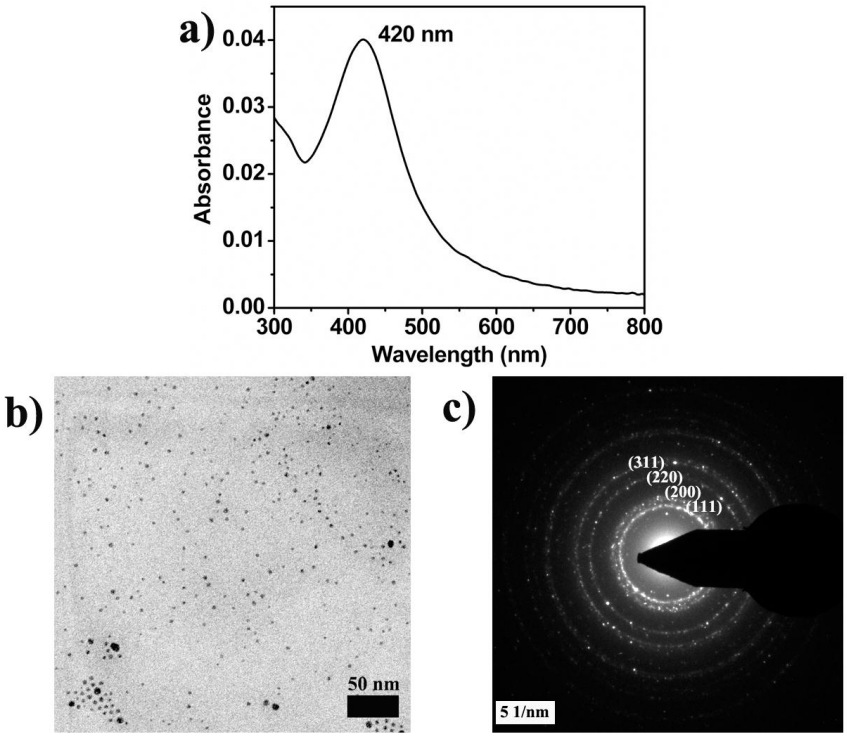
Figure S2. Characterization of Ag nanoparticles prepared using $AgNO_3$ as metal precursor and *wet* THF as solvent: a) UV-visible spectrum; b) TEM BF image; c) SAED pattern



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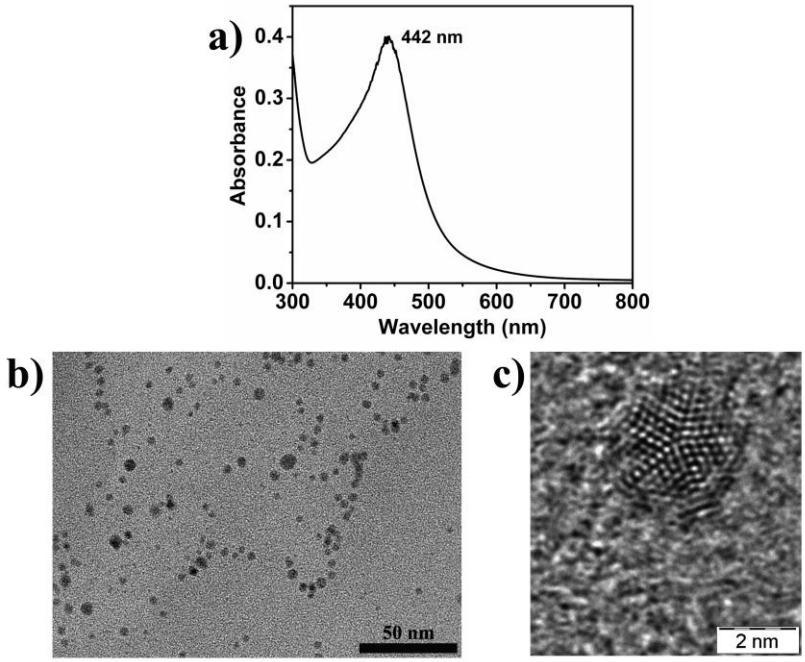

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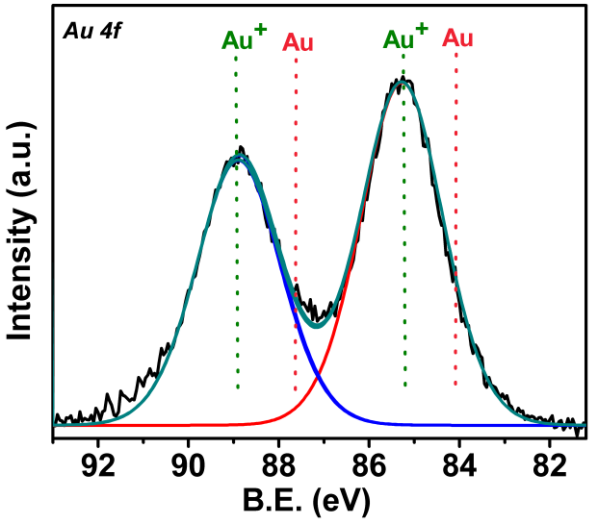

Figure S5. Characterization of Au nanoparticles: a) UV-visible spectrum; b) TEM BF image; c) SAED pattern; d) powder XRD pattern; e) XPS spectrum

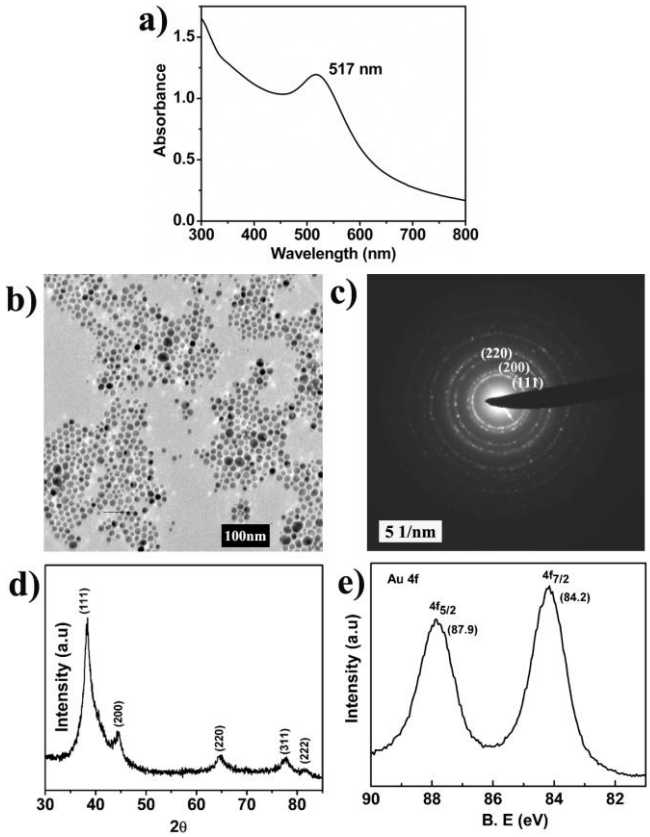

Figure S6. Characterization of Pd nanoparticles: a) UV-visible spectrum; b) TEM BF image; c) HRTEM image; d) FFT pattern generated from Fig S5c; e) powder XRD pattern; f) XPS spectrum

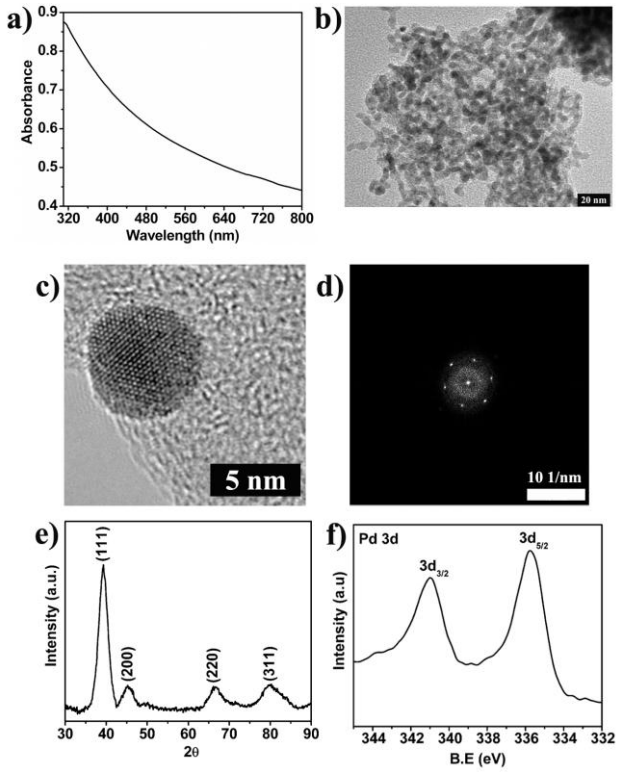

Figure S7. The TEM BF image of Au seeds isolated during the preparation of Au@Ag core-shell nanoparticles

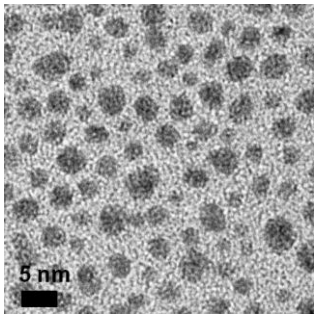

Figure S8. a) HRTEM image; b) powder XRD pattern; and XPS spectra c) Ag 3d and d) Au 4f of Au@Ag core-shell nanoparticles

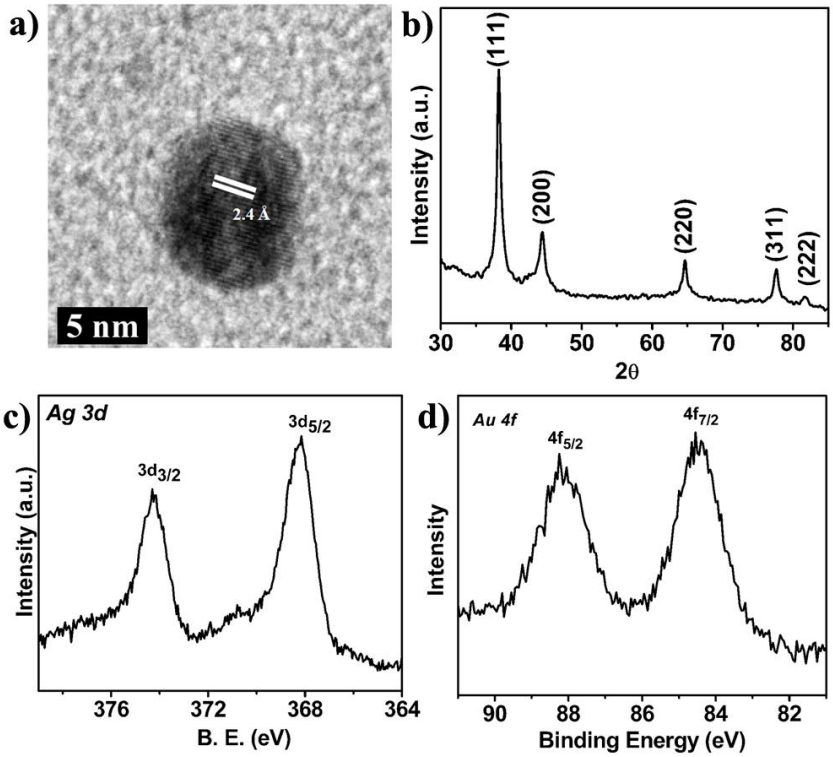

Figure S9. a) HRTEM image; b) powder XRD pattern of Ag@Au core-shell nanoparticles

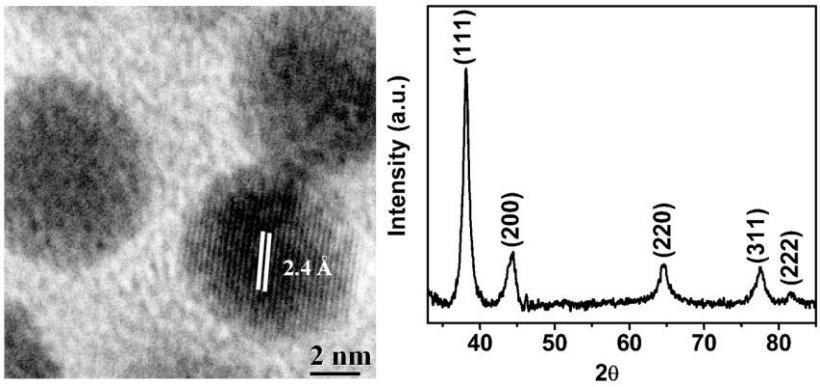

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Figure S10. Characterization of Au-Ag alloy nanoparticles prepared from Au@Ag core-shell nanoparticles: a) TEM BF image; b) SAED pattern; c) powder XRD pattern; XPS spectra d) Ag 3d and e) Au 4f; f) HAADF image marked with analyzed particles; g) the corresponding EDS spectrum

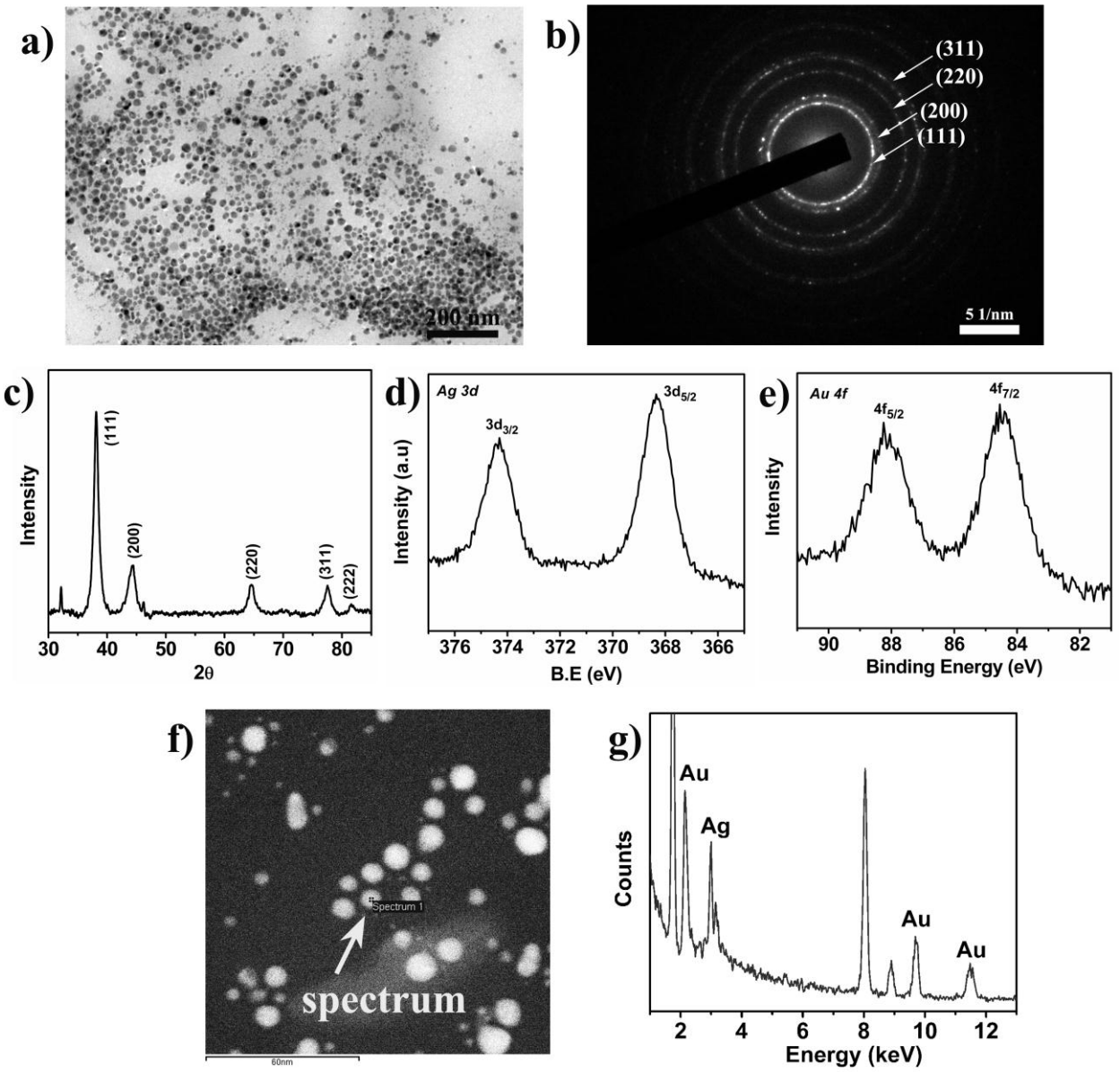
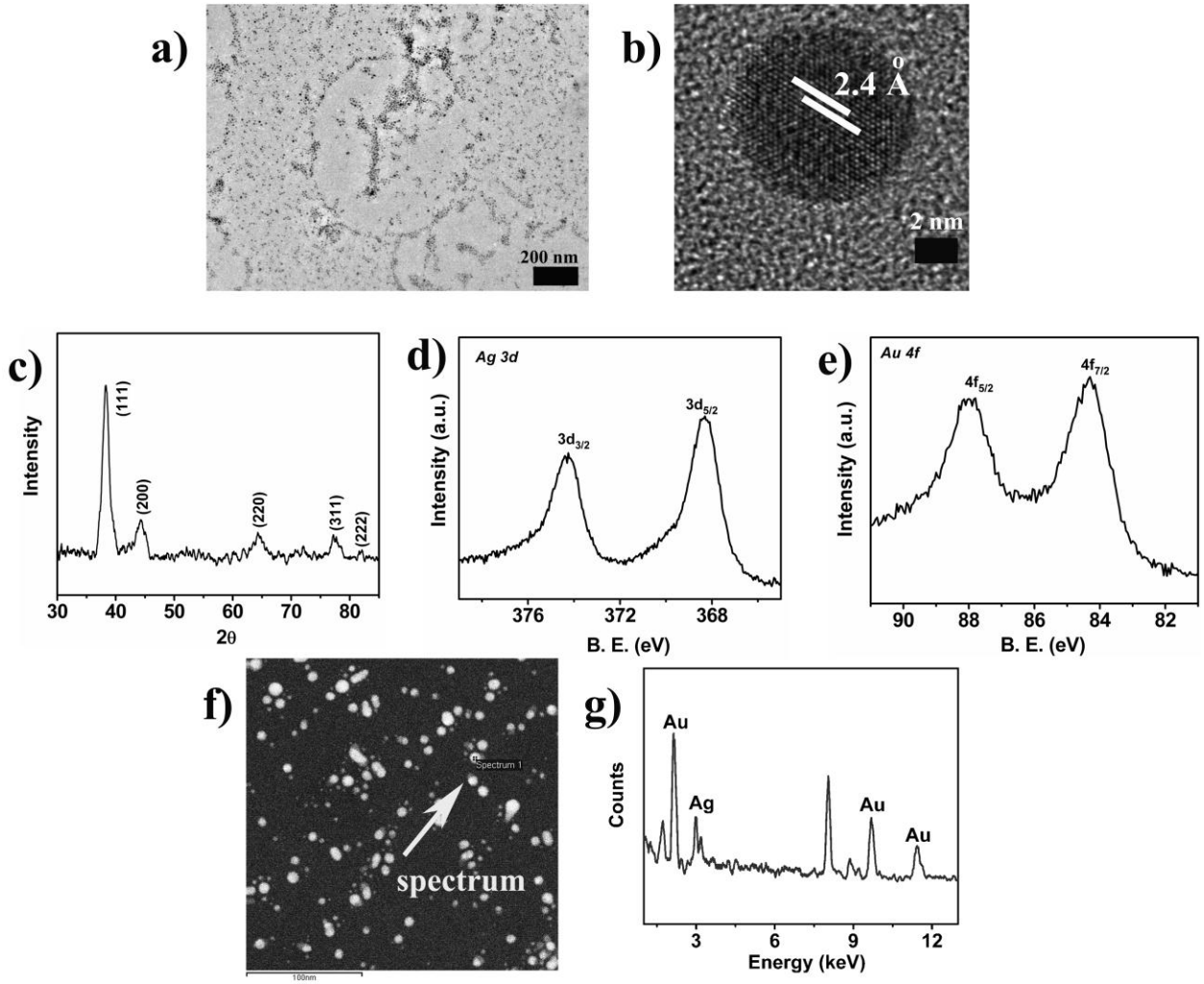


Figure S11. Characterization of Au-Ag alloy nanoparticles prepared from Ag@Au core-shell nanoparticles: a) TEM BF image; b) HRTEM image; c) powder XRD pattern; XPS spectra d) Ag 3d and e) Au 4f; f) HAADF image marked with analyzed particles; g) the corresponding EDS spectrum



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In the XPS spectra we noted that a small intense peak at higher binding energy (370.4 eV and 376.3 eV) along with the peak due to Ag(0). This could be attributed to the oxidation of Ag nanoparticles during sample preparation. In a similar manner a small peak appeared in the lower binding energy (336 eV and 341.3 eV) in Pd 3d spectrum which could be assigned to Pd(0). The origin of the Pd(0) could be due to the reduction of Pd(II) ions by TMAB in the solid state during sample preparation.

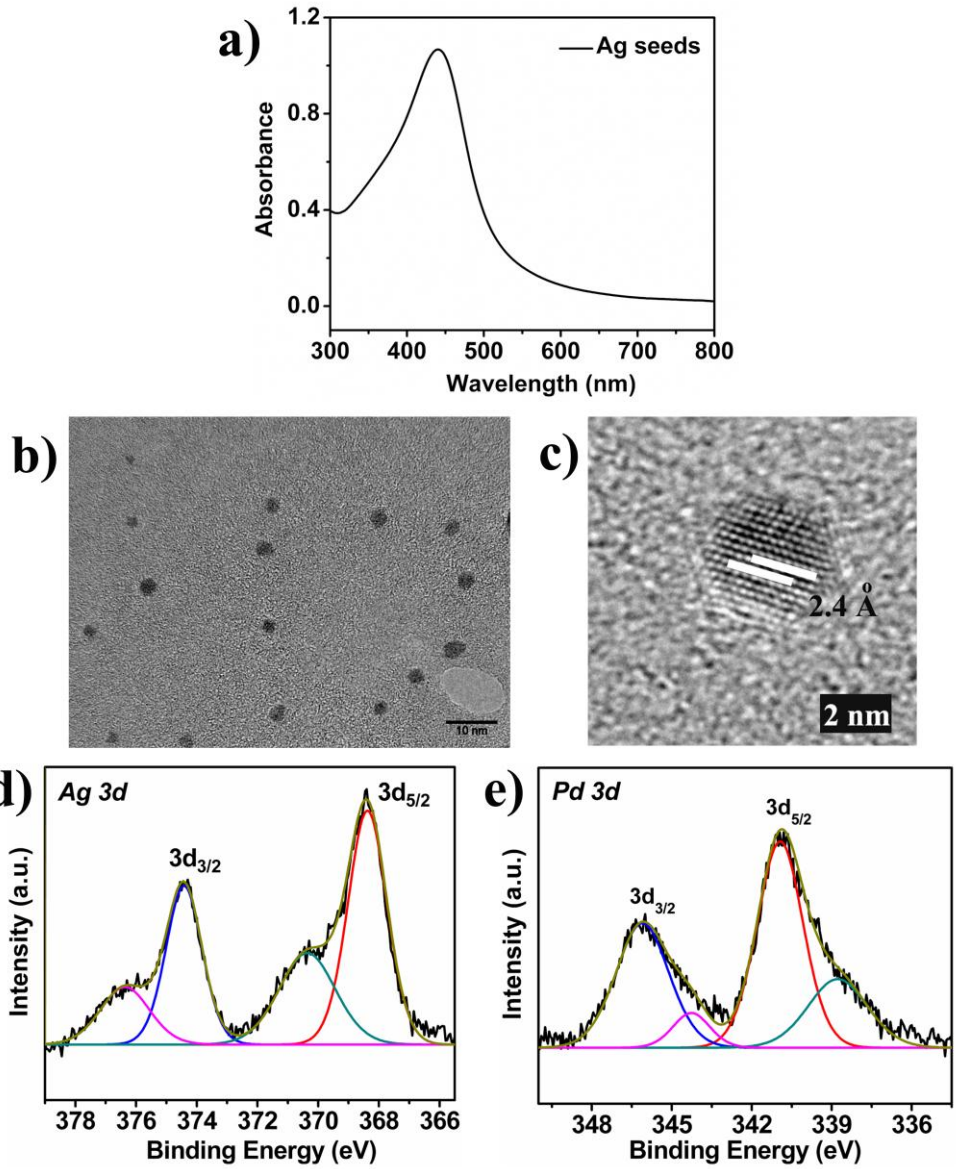

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Figure S13. Powder XRD pattern of Ag@Pd core-shell nanoparticles

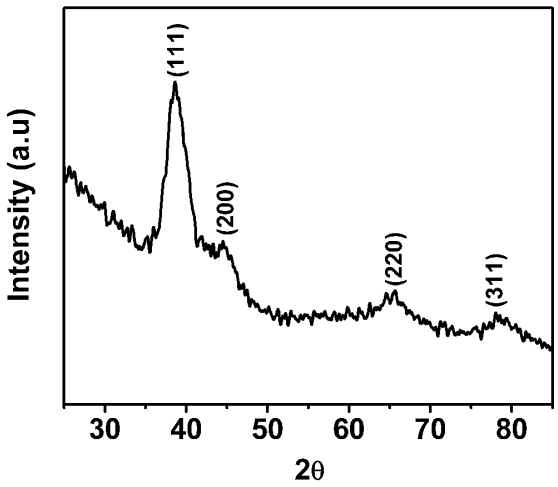

Figure S14. a) HAADF image marked with the individual particle which was analyzed; b) the EDS spectrum, of Ag-Pd alloy nanoparticles

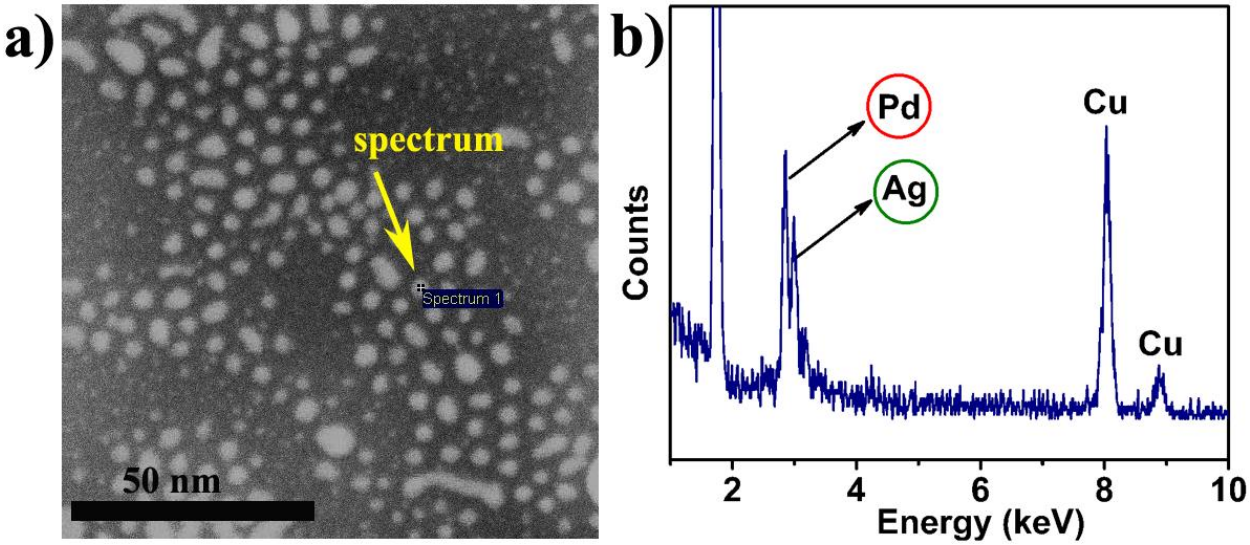

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Figure S15. Detection of peroxide in *wet* THF

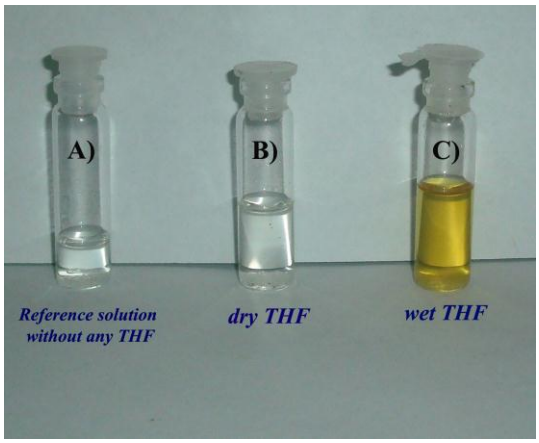
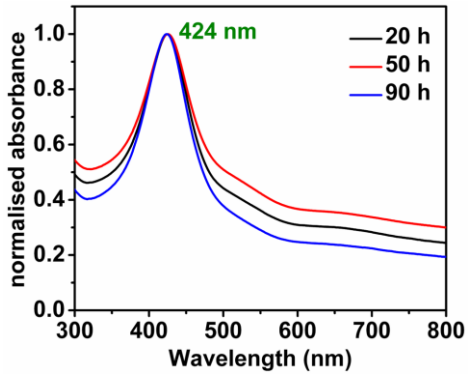


Figure S16. Transformation of Au@Ag core-shell to alloy nanoparticles at 40 ^{o}C. UV-visible absorption spectra recorded at different time intervals a) 20 h – black trace; b) 50 h – red trace; c) 90 h – blue trace



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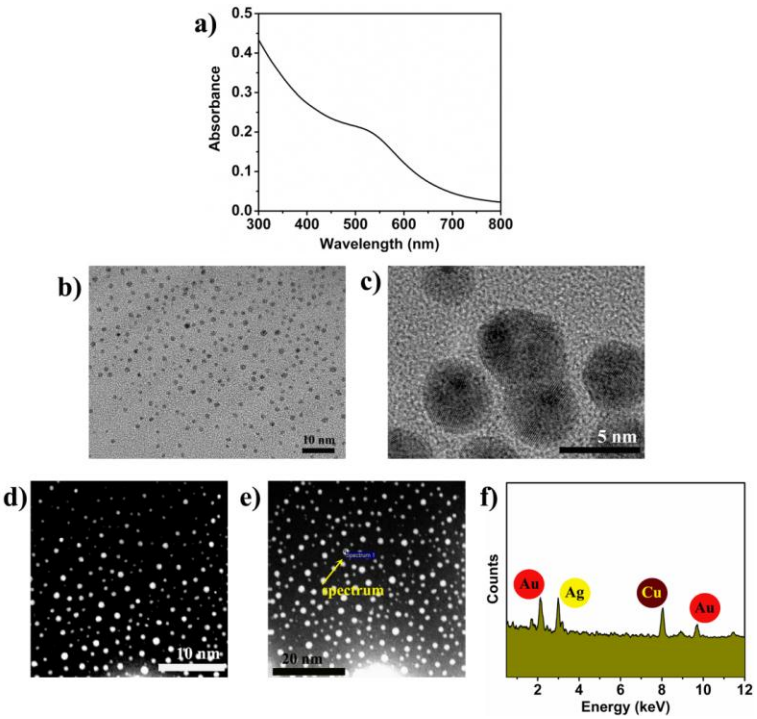
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