

## Supplementary Information

### Synthesis of Au@Ag@Cu trimetallic nanocrystals using three-step reduction

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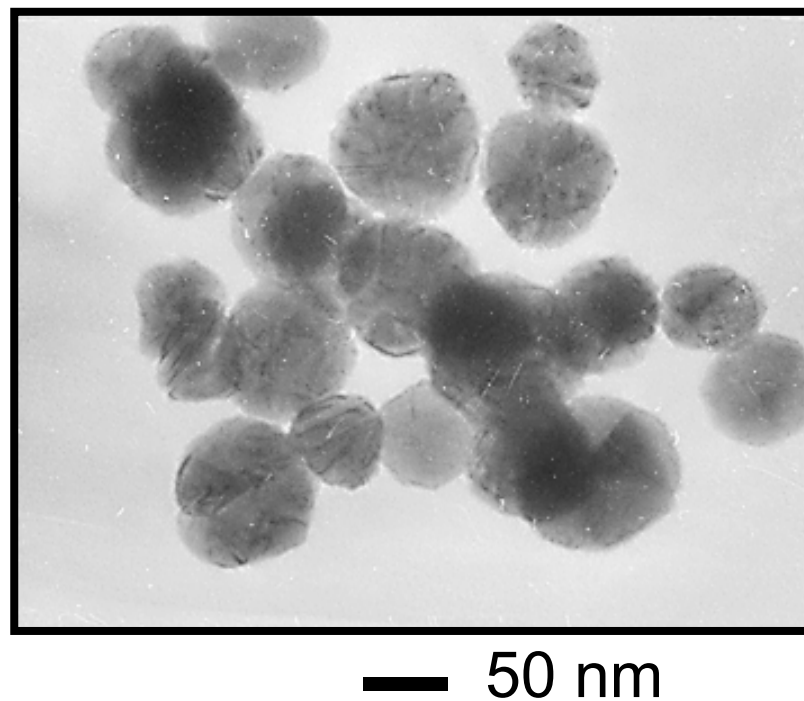
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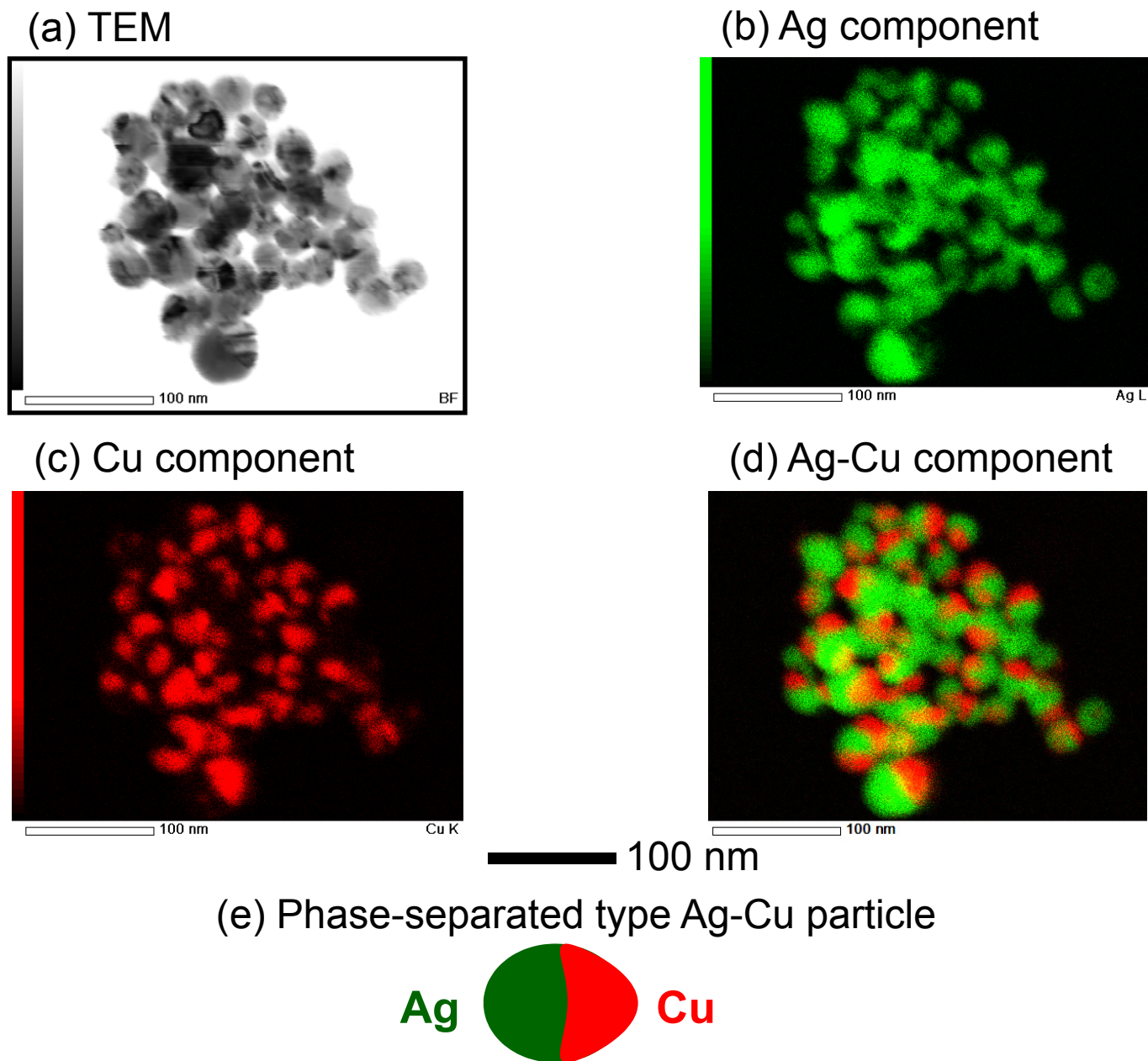
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**Fig. S1.** Cu nanoparticles prepared from  $\text{Cu}(\text{OAc})_2 \cdot \text{H}_2\text{O}$ /PVP/EG solution under microwave irradiation for 15 min. Cu 3.8 mM and PVP 0.5 M.



**Fig. S2.** Phase-separated type Ag-Cu particle prepared by the addition of  $\text{Cu}(\text{OAc})_2 \cdot \text{H}_2\text{O}$  to Ag seed solution.