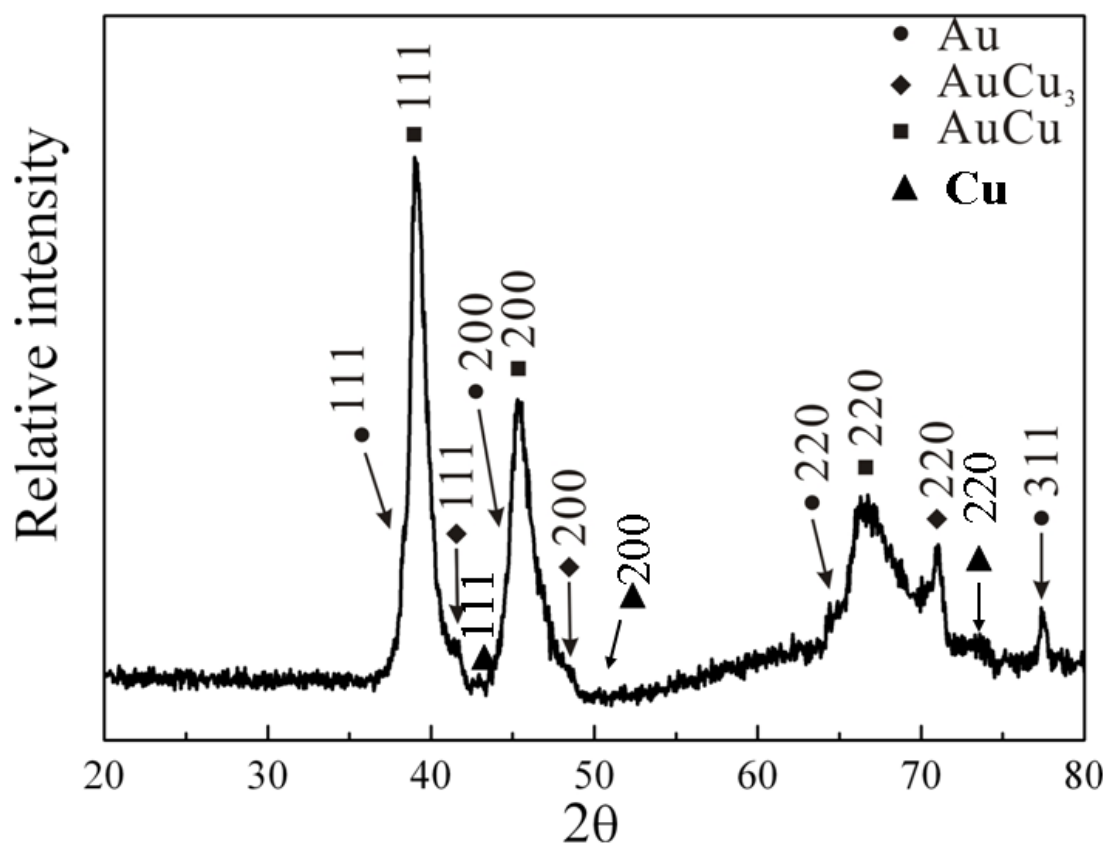


Electronic Supplementary Information

S1. XRD ($\text{CuK}\alpha$) of the $\text{Au}_{50}\text{Cu}_{50}$ target with predominant bimetallic alloys AuCu (disordered fcc A1 structure rather than L1_0 structure as indicated by the absence of 001 and 110 diffractions) and AuCu_3 (fcc rather than L1_2 structure as indicated by negligible 100 and 110 diffractions) as well as minor Au and Cu with fcc isostructure.



S2. Original lattice image of the four-fold Au-rich nanocondensate in Fig. 6a showing atom misregistration and vacancy presumably due to solute trapping at the junction (arrow) and the individual $(001)/(1\bar{1}1)$ and $(3\bar{3}\bar{1})/(\bar{1}12)$ asymmetrical $[110]$ tilt boundaries.

