Dumbbell-like Composite Nanoparticles: Chemical Synthesis and Catalytic Applications\textsuperscript{1} CHAO WANG, SHOUHENG SUN, Brown University, NANOMATERIALS LAB TEAM\textsuperscript{2} — Dumbbell-like NM-Fe\textsubscript{3}O\textsubscript{4} (NM=Au, Ag, Pt and Pd) nanoparticles are synthesized by epitaxial growth of Fe\textsubscript{3}O\textsubscript{4} on noble metal nanoparticle seeds in organic solution. The size of the noble metal and Fe\textsubscript{3}O\textsubscript{4} particles in these dumbbell structures can be well controlled (from 2 nm to 20 nm). These dumbbell nanoparticles are superparamagnetic at room temperature, and also show plasmonic absorption (from Au or Ag). Compared to the single-component noble metal nanoparticles, the dumbbell particles show enhanced catalytic properties, like Pt-Fe\textsubscript{3}O\textsubscript{4} for oxygen reduction and methanol oxidation in the fuel cell, as well as Au-Fe\textsubscript{3}O\textsubscript{4} for the growth of silicon nanowires.

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