Pt-Sn alloy, intermetallic and core-shell nanoparticles capped with varied organic agents (e.g. amine, thiol, carboxylic acid and polymer) were synthesized by colloidal chemistry methods. Transmission electron microscopy (TEM) measurements show that the as-prepared bimetallic materials have quasi-spherical, cubic, tetrahedral, octahedral or short wire-like shapes. Their sizes are controllable in the range of 1-10 nm, and independent of the particle size, the Sn content of the bimetallic nanoparticles can be adjusted from 10 to 80 mol.%. Energy dispersive X-ray (EDX) analyses indicate that for all samples, signals of both Pt and Sn were detected from single nanoparticles, confirming the bimetallic nature of the nanoparticles. X-ray diffraction (XRD) measurements were also conducted on the bimetallic particle systems. Pt-core/Sn-shell nanoparticles show similar XRD patterns with Pt monometallic nanoparticles, suggesting an intact Pt core surrounded by a Sn shell. For random alloy nanoparticles, however, distinct shifts of the Pt diffraction peaks to lower degrees was observed, which gives a clear proof for the alloying of Pt with Sn, whereas quantitative analysis of the lattice parameter shifts indicates that only part of the Sn atoms is incorporated into the alloy nanocrystals. This is consistent with X-ray photoelectron spectroscopy (XPS) measurements which reveal segregation of Sn at the surface of the random alloy nanocrystals.