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One Step Microwave Synthesis of Size Controlled Monodisperse Noble Metal and Bimetallic Nanoparticles using Polymers JEWELL ANNE HARTMAN, KIM HART, BRYCE BROWNFIELD, KYLE CULHANE, JUSTIN CASE, ANDREW BALLAST, KE JIANG, ANATOLIY PINCHUK, Univ Colorado - Colorado Springs, PINCHUK NANOPHOTONICS RESEARCH GROUP TEAM — The size controlled synthesis of near monodisperse and stable noble metal and bimetallic nanoparticles was achieved through the development of one-step microwave assisted polymer stabilized techniques. Two synthetic techniques are presented. The first is a dendrimer assisted technique that uses the dendrimer polyethelenimine (PEI) as both a reducing and stabilizing agent for the synthesis of stable, size controlled noble metal and bimetallic alloy nanoparticles. Size control was achieved through a dual-faceted process by modifying the mass ratio of metal salt to dendrimer or maintaining the mass ratio and modifying the temperature. PEI was chosen since nanoparticles encapsulated with PEI have exhibited stability and antibacterial properties. The microwave parameters were optimized for reaction yield using the Box-Benhken design in terms of time, temperature, and pressure. The second is a green chemistry synthesis technique using the reducing sugar mannose for the synthesis of noble metal nanoparticles. Nanoparticles sizes were estimated using UV/Visible Absorption Spectroscopy, dynamic light scattering and scanning electron microscopy. Mie theory calculations of the extinction spectra for an identical size nanoparticle are also presented.

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