In-situ generated palladium seeds lead to single-step bioinspired growth of AuePd bimetallic nanoparticles with catalytic performance

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Abstract

AuePd bimetallic nanospheres were synthesized via a green approach based on an in situ seed-mediated growth method using *Etlingera elatior* (EE) leaf extract as a bioreducing and capping agent. The synthesized bimetallic Au₁Pd₁, Au₁Pd₁₀, Au₁₀Pd₁ and monometallic Au and Pd nanoparticles were characterized using various spectroscopic and microscopic techniques. This study reveals the morphology control of anisotropic Au nanoparticles, which can be achieved by the addition of palladium into the aqueous reaction mixture. Furthermore, the catalytic ability of each nanoparticle to catalyze the reduction of 4-nitrophenol to 4-aminophenol were investigated. The bimetallic nanoparticles are more efficient in catalyzing the reduction of 4-nitrophenol than monometallic Au and Pd whereby the Au₁Pd₁ was the most efficient, with a rate constant, k , of $24.0 \times 10^{-3} \text{ min}^{-1}$.

Keywords: Alloys, Nanostructures, Electron microscopy, Energy dispersive analysis of X-rays.