Synthesis of bimetallic Ag@CuNPs: Catalytic reductive activity against Rhodamine B

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Abstract: The bimetallic Ag@CuNPs were synthesized using the reductant and oxidant as hydrazine hydrate and silver nitrate, copper nitrate, respectively in absence and presence of stabilizer. The UV-visible spectroscopic and transmission electron microscopic evidence describes the reactivity of Cu^{2+} and Ag^{+} towards hydrazine for the synthesis of Ag@CuNPs in absence and presence of cetyltrimethylammonium bromide (CTAB). The bimetallic nanoparticles obtained were large spherical aggregates in absence of CTAB. The UV-visible spectroscopic data also reveal that the absorbance of Ag@CuNPs increases within the time of mixing and decreases with the passage of time. The stability of the bimetallic nanoparticles was found to decrease with increasing the [Cu^{2+}] but the stability increases on increases the [hydrazine]. The stability of the Ag@CuNPs was found to increase upon the addition of CTAB. The appearance of SPR band at around 600 nm in addition to SPR band corresponding to Ag@CuNPs in presence of CTAB might be due to the pure CuNPs. The TEM results also reveal the presence of small particles adsorbed onto the Ag@CuNPs, confirming the formation of pure CuNPs. The size of the Ag@CuNPs in presence of CTAB ranges between 4-16 nm, indicating that CTAB also controls the size of the nanoparticles. The size of the Ag@CuNPs was also found to decrease on increasing the [hydrazine] in presence of CTAB. The catalytic reductive degradation of rhodamine B (RB) using Ag@Cu bimetallic nanoparticles as a catalyst has been reported. The decrease in [RB] was monitored by UV-visible spectroscopy.

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