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Development of simple procedures to synthesize different colored silver nanoparticles

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A great wealth of research continues to be focused on nanomaterials due to their unusual mechanical and physical properties than on the corresponding bulk materials. Silver nanoparticles (AgNps) ,in particular, have been the subject of many reviews due to its tremendous applications in many industries such as medical, textile, food water purification, personal care products, sensors, coatings and paints. Unlike gold colloidal nanoparticles (NPs), silver colloidal solutions of different colors are not common. The distinctive colors of colloidal silver are due to a phenomenon known as surface plasmon resonance. Although, a great wealth of research has been available in the literature about synthesizing and characterizing, effort aimed at synthesizing one pot, simple, cost effective and time saving procedures to develop AgNps of different colors have been limited. At the same time, the reported methods used to prepare AgNps are not straight forward and most of the available methods involve the seed method, which is a multi step procedure. As the properties of NPs strongly depend on the size, size distribution, shape, crystal structure and surface chemistry, the careful control over these factors are essential to obtain the desired product. In this study our main focus is to investigate simple one pot reactions to synthesize a stable spherical shape AgNps with different sizes which in turn shows different colors using metal salt reduction method. In this investigation five different colors of AgNps have been synthesized using silver nitrate as the metal precursor. Sodium borohydride was used as the main reducing agent and tri sodium citrate was used as the stabilizing and auxiliary reducing agent. Characterization of synthesized AgNps was carried out using UV-Visible spectrometry and the size of the AgNps was investigated using Transmission Electron Microscopy (TEM). The sizes of synthesized AgNps were found to be with an average size of 10 nm, 14 nm, 15 nm, 19 nm and 33 nm for orange, red, greenish yellow, blue, greenish blue respectively.

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