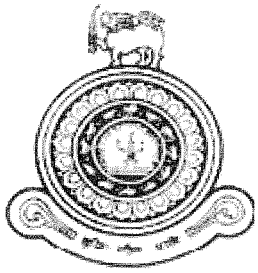

DEVELOPMENT OF SIMPLE PROCEDURES TO MAKE STABLE AND COLORED SILVER NANOPARTICLES

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ABSTRACT

Silver nanoparticles (AgNps) have been subjected to many research publications due to their tremendous applications in areas such as medicine, textiles, food industry, water purification, personal care products, sensors, coatings and paints. However the synthesized methods used to prepare AgNps are not straight forward. Even though there are a large number of reports on synthesis of AgNps, most of them have adopted a seed method which involves many steps. Therefore, in this study the main concern was to investigate a simple one pot reaction to synthesize stable spherically shaped AgNps of different sizes, which in turns show different colors. In this investigation seven different colors of AgNps were synthesized using $AgNO_3$ as the metal precursor. $NaBH_4$ was used as the main reducing agent and tri sodium citrate and hydrazine sulphate were used as the stabilizing and auxiliary reducing agents. Characterization of synthesized AgNps was carried out using UV-Visible spectrometry and the nano nature of the samples and the size of the particles were investigated using Transmission Electron Microscopy (TEM). The sizes of synthesized AgNps were found to be an average size of 10 nm, 14 nm, 15 nm, 19 nm and 33 nm for orange, red, greenish yellow, blue, greenish blue respectively. Factors affecting the formation of AgNps such as silver nitrate concentration, reducing agent concentrations, reaction temperature and reaction pH were also studied using the procedure employed in the synthesis of greenish blue colored AgNps. The stability is a key feature when considering potential applications. Therefore storage conditions for the prepared AgNps were investigated. The stability of the synthesized AgNps at different temperatures such as room temperature, 4 ^{o}C and -20 ^{o}C were studied. The most stable temperature was found to be 4 ^{o}C in order to store AgNps for a longer period of time. According to the factors studied for stabilization of AgNps it was observed that the optimum pH to synthesize distinctively colored AgNps should be in the range of 7-8.