Gold Nanoparticle Generation with the Assistance of Atmospheric Pressure Non-Thermal Microplasma

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Numerous methods, such as chemical reduction, biosynthesis and laser ablation, all account for the generation of nanoparticles. However, the environmental-friendliness and swiftness in plasma electrochemical synthesis is more adherent towards the scientific community. Here, presented in this report, colloidal gold nanoparticles were generated using atmospheric pressure, non-thermal plasma to formulate an aqueous electrolyte solution containing hydrogen tetrachloroaurate [HAuCl4] and trisodium citrate [Na3C6H5O7]. The atmospheric pressure, non-thermal plasma chemistry facilitated a rapid synthesis of the gold nanoparticles. For the first set of solution testing, the concentrations of the gold and the sodium citrate were changed. Fifteen trials were conducted to determine the optimum conditions and effects of the new concentrations. Other parameters such as current, voltage, mode, and distance were also tested for maximum efficiency for generating the nanoparticles. The resulting nanoparticles were then subjected to testing for optical properties. Optical properties of the gold nanoparticles were characterized by ultraviolet-near infrared spectroscopy. The gold nanoparticles were categorized by their respective concentration, maximum wavelength peak and absorbance. Results show that concentrations of 34 mM trisodium citrate and 8.9712 mM of gold were the optimal concentrations for the electrolyte solution. With a steady discharge, a one millimeter distance and a flow rate of 0.05 SL/M, the synthesized gold nanoparticles were formed with a 623.9 nm maxi-peak wavelength and a .580 absorbance. Taken together, I summarize the conditions under which this environmentally friendly and rapid technique can be used to generate gold nanoparticles for diagnostic and research use.

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