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Colorimetric determination of Silver Nanoparticles with Dithizone-based in Aqueous Media

Silver nanoparticles (AgNPs) has been widely used for commercial products with many applications. An increasing number of commercial products cause risks and exposure of AgNPs effects for human and the environment. Therefore, the measurement of AgNPs in the aquatic environment is important. Dithizone ligand is evaluated as one of the most effective chelating reagents for metal ions because of its high sensitivity and selectivity. In this work, dithizone was carried out for AgNPs detection in the aquatic environment. Dithizone is focused on the geometry conformation and interaction of dithizone with silver using UV-Vis spectroscopy and FT-IR spectroscopy using density functional approaches B3LYP and the 6-31G(d,p) basis set. Moreover, the silver-dithizone complex was investigated using ^1H NMR spectra using B3LYP/6-311+G(2d,p) level of calculation compared with the experimental data. The results revealed the ion exchange interaction between hydrogen of dithizone and silver with the lowest of binding energies of silver-dithizone complex formation. When AgNPs was added to the dithizone solution, affected color change from colorless to orange was observed. While the metal ions such as Na^+ , K^+ , Cu^{2+} , Mg^{2+} , Ba^{2+} , Mn^{2+} , Fe^{3+} , Co^{2+} , Ni^{2+} , Cu^{2+} , Ag^+ , Zn^{2+} , Cd^{2+} , Hg^{2+} and Pb^{2+} didn't interfere with the recognition process for AgNPs. Therefore, the results can be the useful information for the measurement of complex interaction using the analysis of computer simulations and the limit of detection for AgNPs were 0.071 mg/L. Finally, this method can be applied for determination of AgNPs in the aquatic environment.

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