

Recognition of hydrazone-containing benzimidazole derivative towards bismuth (III) ion studied by UV–vis spectrometry and DFT calculations

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ABSTRACT

A simple, selective and sensitive spectrophotometric method for the direct determination of trace amounts of Bi^{3+} in real samples was developed based on complexation reactions between Bi^{3+} and two benzyl-functionalized benzimidazolylidene ligands (L1 and L2). The important analytical parameters, such as pH, amounts of the reagents, and their effects on UV–vis absorption properties of the studied systems were investigated. Under the optimum conditions, the absorbance of the Bi^{3+} -L complex obeys Beer's law in Bi^{3+} concentration range of 0.21–6.48 $\mu\text{g}\cdot\text{mL}^{-1}$ with the limit of detection of 95.51 and 55.80 $\mu\text{g}\cdot\text{mL}^{-1}$ for Bi^{3+} -L1 and Bi^{3+} -L2, respectively. The proposed method was successfully applied to the determination of Bi^{3+} content in water samples and stomach medicine samples. DFT calculations showed that L2 has higher selectivity towards Bi^{3+} than L1.

Keywords: Bi^{3+} ion detection; Benzyl-functionalized benzimidazolylidene derivative; Uv-vis spectrometry; DFT

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