Part 1. Spectrophotometric determination of trace mercury (II) in dental-unit wastewater and fertilizer samples using the novel reagent 6-hydroxy-3-(2-oxoindolin-3-ylideneamino)-2-thioxo-2H-1,3-thiazin-4(3H)-one and the dual-wavelength β-correction spectrophotometry

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ABSTRACT

A simple and low cost method was developed and validated for the determination of trace mercury (II) ions in dental-unit wastewater and fertilizer samples. The method was based upon the reaction of mercury (II) ions with the novel reagent 6-hydroxy-3-(2-oxoindolin-3-ylideneamino)-2-thioxo-2H-1,3-thiazin-4(3H)-one, the formed complex shows an absorption maximum at 505 nm (λ_{max}) in Britton–Robinson (B–R) buffer (pH 4–6). The corrected absorbance of the formed complex at λ_{max} was obtained employing β-correction spectrophotometric method. Beer's–Lambert law and Ringbom's plots of the colored Hg–reagent complex were obeyed in the concentration range of 0.2–2.0 and 0.32–0.96 $\mu g\,mL^{-1}$ mercury (II) ions, respectively with a relative standard deviation in the range of 2.1±1.3%. The limits of detection (LOD) and quantification (LOQ) of the procedure were 0.026 and 0.086 $\mu g\,mL^{-1}$ Hg^{2+}, respectively. The proposed method was applied for the analysis of mercury (II) in dental-unit wastewater and fertilizer samples. The validation of the method was tested by comparison with the data obtained by the inductively coupled plasma-mass spectrometry (ICP-MS). The statistical treatment of data in terms of Student's t-tests and variance ratio f-tests has revealed no significance differences.