

Accepted Manuscript

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PII: S1386-1425(17)30630-3
DOI: doi: [10.1016/j.saa.2017.08.001](https://doi.org/10.1016/j.saa.2017.08.001)
Reference: SAA 15358

To appear in: *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*

Received date: 20 May 2017
Revised date: 31 July 2017
Accepted date: 1 August 2017

Please cite this article as: Marwa E. Mohamed, Eman Y.Z. Frag, Mona A. Mohamed , A newly validated and characterized spectrophotometric method for determination of a three water pollutants metal ions, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* (2017), doi: [10.1016/j.saa.2017.08.001](https://doi.org/10.1016/j.saa.2017.08.001)

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A newly validated and characterized spectrophotometric method for determination of a three water pollutants metal ions

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Abstract

A simple, fast and accurate spectrophotometric method had been developed to determine lead (II), chromium (III) and barium (II) ions in pure forms and in spiked water samples using thoron (THO) as a reagent forming colored complexes. It was found that the formed complexes absorbed maximally at 539, 540 and 538 nm for Pb(II)-THO, Cr(III)-THO and Ba(II)-THO complexes, respectively. The optimum experimental conditions for these complexes had been studied carefully. Beer's law was obeyed in the range 1 –35, 1 – 70, and 1 – 45 $\mu\text{g mL}^{-1}$ for Pb (II), Cr(III) and Ba(II) ions with THO reagent, respectively. Different parameters such as linearity, selectivity, recovery, limits of quantification and detection, precision, and accuracy were also evaluated in order to validate the proposed method. The results showed that, THO was effective in simultaneous determination of Pb(II), Cr(III) and Ba(III) ions in pure forms and in spiked water samples. Also, the results of the proposed method were compared with that obtained from atomic absorption spectrometry. The isolated solid complexes had been characterized using elemental analysis, X-ray powder diffraction (XRD), IR, mass spectrometry and TD-DFT calculations. Their biological activities were investigated against different types of bacteria and fungi organisms.

Key words: Lead(II), chromium(III), barium(II), thoron, spectrophotometry, Beer's law, TD-DFT, XRD.

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