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Comparative study on miscellaneous spectral analytical techniques for determination of uranium (VI) concentration

The need for sensitive and reliable analytical techniques for determination of uranium concentration is an important in many fields. Although a series of methods based on different instrumental techniques are reported in literature to determine uranium in different kinds, there is no superior method. Considering the advantages and disadvantages of the existing techniques, the current trends in the literature are the development of a robust, simple, and relatively cheap determination method that can be used in any laboratory. Therefore, The present study is introduced a comparative study on miscellaneous spectral analytical techniques for determination of uranium (VI) concentration; Photometers techniques as spectrophotometry, and spectrofluorometry, Laser based techniques as laser fluorimetry, and time-resolved laser-induced fluorimetry (TRLIF), and Spectrometric techniques as atomic absorption spectrometry with flame atomization (FAAS), electrothermal atomic absorption spectrometry with graphite furnace atomization (GFAAS), and inductively coupled plasma-optical emission spectrometry (ICP-OES) used for determination of totally uranium concentration, mainly U238. The selection of these techniques is based on many factors; power of detection, selectivity, common used in many laboratory, various based techniques from conventional to advanced technologies, and cost. The current trends for each technique are also presented. Also, this study is not cover certain time period to figure out several various analytical techniques. The basic principles of these analytical techniques are beyond the scope of the present study.

These techniques allow the determination of U(VI) in micro and trace levels simply and quickly. The choice of one analytical technique must take into consideration many factors, such as the costs of analysis, the nature of the sample being analyzed, the required (accuracy, precision, sensitivity, selectivity, robustness, ruggedness, scale of operation, analysis time), the quantity of sample, the need for separation and/or preconcentration, and of course the availability of equipment and reagents in the laboratory there. At the end, there is no single universal spectral technique available that is applicable to all samples. Conversely, several different techniques may give similar results for a given sample. Every analytical technique is designed or best suited to answer a kind of question. So, the choice of the technique depends on the questions we want to answer about our sample.

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