

# Flow injection Thorium determination

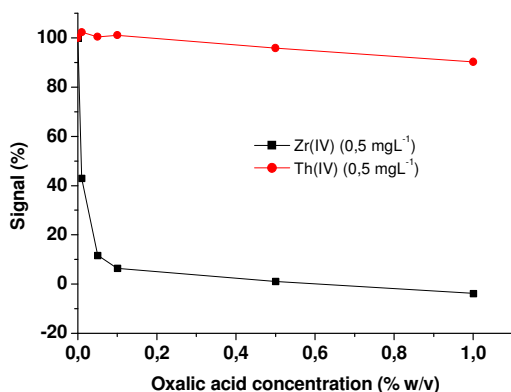
A. S. F. de Sousa<sup>1</sup>  
e-mail: [alvaro@ien.gov.br](mailto:alvaro@ien.gov.br)

<sup>1</sup> Division of Nuclear Engineering - IEN

**Keywords:** flow injection, Thorium, Arsenazo III

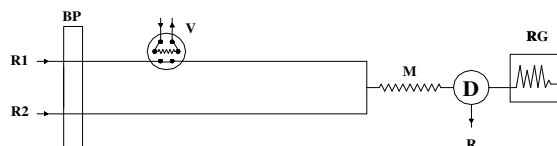
This method is based on a colorimetric reaction between Arsenazo III and Th(IV) [1], producing an Arsenazo III-Th(IV) complex in a strongly acid medium (HCl 5-7 mol L<sup>-1</sup>).

The high selectivity can be ensured and only zirconium and uranium interfere. The influence of zirconium can be sharply reduced [2] by carrying out the determination in the presence of oxalic acid (Figure 1) and the uranium by keeping it at oxidation state VI.



**Figure 1.** Effect of the oxalic acid concentration on the signal measurement (%) of Zr(IV) and Th(IV) in HCl medium.

A sample of Th(IV) solution is injected in the system, reacting with Arsenazo III and then detected in a spectrophotometer at 661nm (Figure 2).



**Figure 2.** Flow Injection Analysis (FIA) system: (R1) HCl 3.6 molL<sup>-1</sup> + oxalic acid; (R2) Arsenazo III + HCl 3.6 molL<sup>-1</sup>; (BP) peristaltic pump; (V) Injection valve; (M) Mixer; (D) Detector; (RG) chart recorder; (R) reject.

The calibration curves have showed a linear behavior ( $R^2 = 0.9995$ ) between the concentration range of 0.05 and 2.0 mgL<sup>-1</sup>. A relative deviation standard of 5.0 % (at 0.1 mgL<sup>-1</sup>) and a detection limit of 0.02 mgL<sup>-1</sup> were obtained, as well an analytical throughput of 60 sample determinations per hour.

## References

- [1] Palei, P. N. Analytical Chemistry of Uranium. London. Ann Arbor-Humphrey Science Publishers, Inc., 1970.
- [2] Savvin, S. B. Analytical use of arsenazo III – Determination of thorium, zirconium, uranium and rare earth elements. Talanta, 8: 673-685, 1961