Flow injection Uranium and Zirconium determination

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A chemical quality control of nuclear materials by Flow Injection Analysis (FIA) system for uranium and zirconium determination in presence one of each with no prior separation is presented [1]. This method is based on a colorimetric reaction between Arsenazo III and U(IV) and Zr(IV), producing an Arsenazo III-U(IV) and Arsenazo III-Zr(IV) complexes in a strongly acid medium [2]. Although Arsenazo III is not a specific reagent for uranium, high selectivity can be ensured in a strongly acid medium (Figure 1), when in the oxidation state (IV).

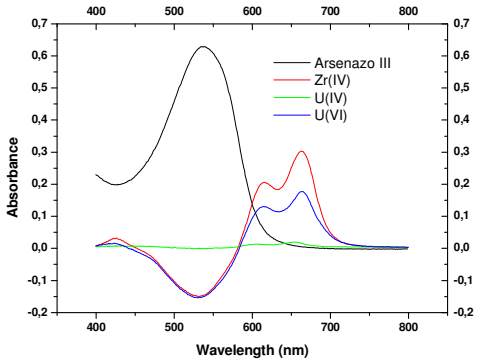

Figure 1. Absorption spectra of Arsenazo III, Arsenazo III-U(IV), Arsenazo III-U(VI) and Arsenazo III-Zr(VI) in acid medium (HCl 3,6 molL^{-1}).

Only thorium interfere should be preliminary separated. This method has two steps (Figure 2). In the first step a portion of the sample with a moisture of Zr(IV) and U(VI) is injected by passing outside the reduction column. Only Zr(IV) is detected and determinate. In the second step other portion of the same sample is injected and U(VI) is reduced to U(IV) by passing the sample through column filled with metallic lead. U(VI) is reduced to U(IV), and then detected together with Zr(IV) A difference between the second and first values determine the uranium concentration [3]. A analytical throughput of 30 sample determination per hour was obtained.

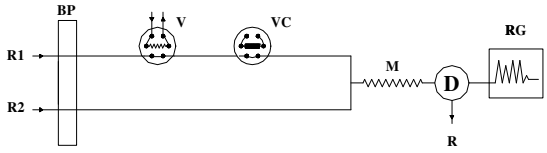

Figure 2. Flow Injection Analysis (FIA) system: (R1) HCl 3.6 molL^{-1}; (R2) Arsenazo III + HCl + 3.6 molL^{-1}; (BP) peristaltic pump; (V) Injection valve; (VC) Injection valve with Column reduction; (M) Mixer; (D) Detector; (RG) chart recorder; (R) reject.

References

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