

## Electrochemical Determination of Trace Concentrations of Uranium in Saline Solutions

KIRBY, M.E.<sup>1</sup>, SALAUN, P.<sup>2</sup> AND WEISS, D.J.<sup>1</sup>

<sup>1</sup>Imperial College London, SW7 2BP

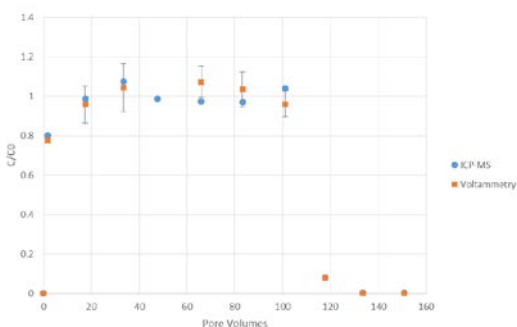
(mek15@ic.ac.uk, d.weiss@imperial.ac.uk)

<sup>2</sup>University of Liverpool L3 5TR

(Pascal.Salaun@liverpool.ac.uk)

In the United Kingdom, uranium (U) constitutes one of the largest radionuclides by mass, that will be disposed of in a cement backfilled, Intermediate Level Waste Repository. In order for the environmental safety case to be approved, it is of paramount importance to understand the mobility of U through fractured rocks in cement leachates leaving the repository, as this is ultimately the controlling process. This is best investigated through column studies. A key challenge to these studies is the accurate and precise determination of U in solutions with high ionic strength and low U concentrations.

To this end, we tested and implemented an adsorptive stripping voltammetric technique, using chloranilic acid as a complexing agent, and potassium nitrate as background electrolyte. We optimized various analytical parameters, including solution pH, deposition potential, and pulse frequency. The optimised method provides a precision of ca 7 %, a sensitivity of 0.92nA/ppb, and a reproducibility of ca 7% at the low ng/ml level. The detection range is between approx. 0.46 and 30 ng/ml. The method was subsequently used to successfully determine the breakthrough curve of U in a solution of 0.1M KNO<sub>3</sub> and a U concentration of 10  $\mu$ g/ml passing through a quartz column. We now have a rapid, robust method for analysing uranium to study the mobility of this toxic element in fractured rocks.



**Figure 1:** Breakthrough curve of 10  $\mu$ g/ml uranium 0.1M KNO<sub>3</sub> solution from a quartz column.