

## Experiment Report Form

**The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.**

Once completed, the report should be submitted electronically to the User Office using the **Electronic Report Submission Application:**

<http://193.49.43.2:8080/smis/servlet/UserUtils?start>

### ***Reports supporting requests for additional beam time***

Reports can now be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

### ***Reports on experiments relating to long term projects***

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

### ***Published papers***

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

### **Deadlines for submission of Experimental Reports**

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

### **Instructions for preparing your Report**

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.



	<b>Experiment title:</b> Uranium (VI) complexation with tri-butyl-phosphate (TBP) in room temperature ionic liquid	<b>Experiment number:</b> CH-1567
<b>Beamline:</b> BM20	<b>Date of experiment:</b> from: 28/11/2003 to: 02/12/2003	<b>Date of report:</b> 23/08/2004
<b>Shifts:</b> 12	<b>Local contact(s):</b> Christoph Hennig	<i>Received at ESRF:</i>
<b>Names and affiliations of applicants</b> (* indicates experimentalists): Isabelle Billard, Clotilde Gaillard*, Soufiane Mekki*  Institut de Recherches Subatomiques Chimie Nucléaire F-67037 STRASBOURG cedex 2		

## Report:

The aim of this work is to study the complexation mechanism between uranyl and TBP in  $C_4mimTf_2N$ . In kerosene, it is well known that the extraction of uranyl is made through the formation of a neutral complex  $UO_2(NO_3)_2(TBP)_2$ . In imidazolium based-RTILs, the studies made until now on cation transfert from acidic aqueous solution into the RTIL containing a neutral extractant agent (like crown-ether) [i] suggest that the extraction may not be achieved through the formation of a neutral complex, but by a cation exchange process between a cationic complex and the imidazolium cation.

We have analysed solutions in which uranyl ions are readily dissolved and solutions obtained from liquid-liquid extraction, in order to compare the coordination sphere of uranyl extracted in TBP/ $C_4mimTf_2N$  the coordination sphere of uranyl dissolved in the same solution. The influence of the anion on the nature of the complexes formed was checked by analyzing TPB/ $C_4mimTf_2N$  solutions in which uranyl salts are dissolved (uranyle nitrate and triflate). The effect of the solvent on the structure of the complexes formed was checked by using  $C_4mimTf_2N$  and a conventional aliphatic solvent, dodecane.

Figure 1 displays the exepimental spectra of 3 samples.  $(UO_2)(NO_3)_2(TBP)_2$  is the our reference compound, known to be the neutral extracted species by the TBP/dodecane system. This is confirmed by our experiment, the two EXAFS and corresponding FT are identical. The green line represents the spectrum of a sample obtained by liquid liquid extraction of uranyl by the system TBP/ $C_4mimTf_2N$ . The difference observed on the FT spectra, in particular in the 2-2.25 Å region which corresponds to the nitrate ions, show that the uranyl complex extracted in this case is not the neutral  $(UO_2)(NO_3)_2(TBP)_2$ , but certainly a cationic complex. The data analysis is still under progress.

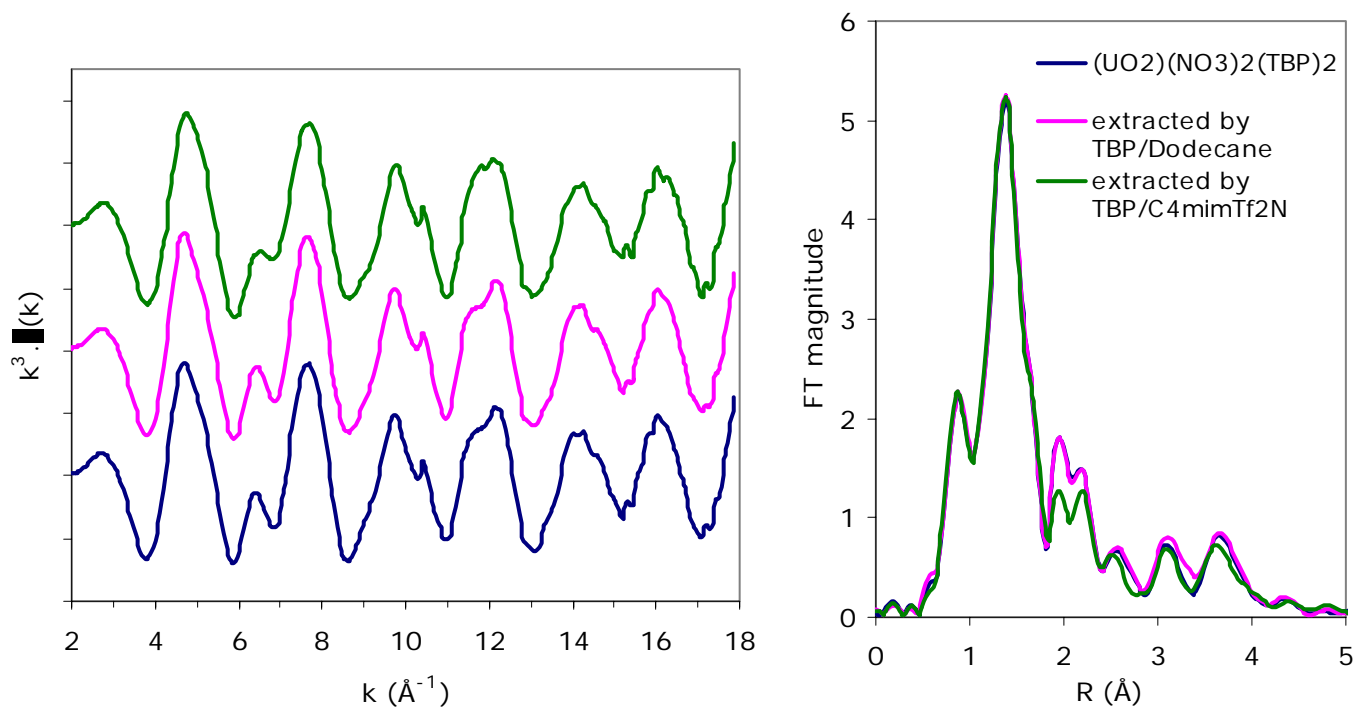


Figure 1 : EXAFS and corresponding Fourier Transform of analyzed samples

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[i] M.P. Jensen, J.A. Dzielawa, P. Rickert, M.L Dietz, J. Am. Chem. Soc., 2002, 124, 10664.