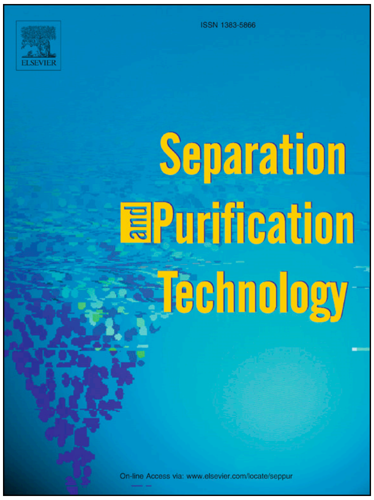

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Maria Boltoeva, Clotilde Gaillard, Sylvia Georg, Vasilii K. Karandashev,
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PII: S1383-5866(17)33408-1
DOI: https://doi.org/10.1016/j.seppur.2018.04.003
Reference: SEPPUR 14499

To appear in: *Separation and Purification Technology*

Received Date: 18 October 2017
Revised Date: 20 March 2018
Accepted Date: 1 April 2018

Please cite this article as: M. Boltoeva, C. Gaillard, S. Georg, V.K. Karandashev, A.N. Turanov, Speciation of uranium(VI) extracted from acidic nitrate media by TODGA into molecular and ionic solvents, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.04.003

Speciation of uranium(VI) extracted from acidic nitrate media by TODGA into molecular and ionic solvents

Dr. Maria Boltoeva,*[a,b] Dr. Clotilde Gaillard, *[c] Sylvia Georg,[a,b] Dr. Vasilii K. Karandashev,[d,e] and Dr. Alexander N. Turanov[f]

[a] Université de Strasbourg, IPHC, 23 rue du Loess 67037 Strasbourg, France
[b] CNRS, UMR7178, 67037 Strasbourg, France
[c] Institut de Physique Nucléaire de Lyon, CNRS-IN2P3, 69622 Villeurbanne cedex, France
[d] Institute of Microelectronics Technology and High Purity Materials, Russian Academy of Sciences, 142432 Chernogolovka, Russia
[e] National University of Science and Technology MISiS, Moscow, Russia
[f] Institute of Solid State Physics, Russian Academy of Sciences, 142432, Chernogolovka, Russia
*Corresponding authors at: IPHC, 23 rue du Loess 67037 Strasbourg, France. E-mail: maria.boltoeva@iphc.cnrs.fr (M. Boltoeva)
Institut de Physique Nucléaire de Lyon, CNRS-IN2P3, 69622 Villeurbanne cedex, France. E-mail: clotilde.gaillard@ipnl.in2p3.fr (C. Gaillard)

Highlights

Speciation of extracted U(VI) is studied by UV-vis and EXAFS spectroscopy

U(VI) complex is identified as $UO_2(NO_3)_2$(TODGA) in the conventional extraction system

U(VI) is extracted by a TODGA and an ionic liquid mixture as $[UO_2(TODGA)_2]^{2+}$

When pure IL is used as diluent, the extracted uranyl complex is $[UO_2(TODGA)_2]^{2+}$

Hydrophobic Tf_2N- play a counterions role in the uranium extracted species

Keywords: Uranium(VI), Ionic liquid, Solvent extraction, TODGA, Speciation, EXAFS spectroscopy, UV-vis absorption spectroscopy

Abstract

The speciation of uranium(VI) extracted by a molecular extractant *N,N,N′,N′*-tetra(*n*-octyl)diglycolamide (TODGA) and a hydrophobic ionic liquid (IL), namely 1-butyl-3-methylimidazolium *bis*(trifluoromethanesulfonyl)imide [C_4mim][Tf_2N], mixture from acidic nitrate media in 1,2-dichloroethane (DCE), and, for comparison, with only TODGA dissolved in DCE or IL has been studied by UV-vis and EXAFS spectroscopy. Our results confirm that the extraction in the conventional system occurs *via* a common solvation mechanism, at high acidity the extracted complex was identified as [$UO_2(NO_3)_2$(TODGA)]. The addition of hydrophobic bistriflimide anions (Tf_2N^-) in the aqueous phase or IL in the organic phase results in a formation of another uranyl complex, in which two tridentate TODGA ligands directly coordinate metal cation and two NO_3^- and/or Tf_2N^- anions are expulsed in the outer sphere and act as charge balancing ions. When pure IL is used as diluent for TODGA ligand, the extracted uranyl complex has the same composition and stoichiometry as in the previous case, $[UO_2(TODGA)_2]^{2+}$.