



Impact of γ -irradiation on the palladium behaviour in the PUREX process

B. Simon, C. Bouyer, S. de Sio, C. Berthon, F. Miserque, N. Boubals, A. Chagnes, L. Berthon

► To cite this version:

B. Simon, C. Bouyer, S. de Sio, C. Berthon, F. Miserque, et al.. Impact of γ -irradiation on the palladium behaviour in the PUREX process. 5th-International Nuclear Chemistry Congress, Aug 2017, Göteborg, Sweden. cea-02435099

HAL Id: cea-02435099

<https://cea.hal.science/cea-02435099>

Submitted on 10 Jan 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Impact of γ -irradiation on the Palladium behaviour in the PUREX process

B. SIMON^{a*}, C. BOUYER^a, S. DE SIO^d, C. BERTHON^a, F. MISERQUE^b,
N. BOUBALS^a, A. CHAGNES^b, L. BERTHON^a

^aCEA Marcoule, DEN, RadioChemistry & Processes Department, Bagnols-sur-Cèze Cedex, F-30207, France

^bCEA Saclay, DEN, Physico-Chemical Department, Gif-sur-Yvette, F-91190, France

^cGéoRessources - UMR CNRS 7359-CREGU-Université de Lorraine, Vandoeuvre les Nancy Cedex, F-54518 (France)

^dAREVA NC, BUR/DT/DRDP, Paris La Défense, F-92084, France

* E-mail address: benedict.e.simon@cea.fr

Abstract

The PUREX process uses 30%_{Vol} tri-*n*-butylphosphate (TBP) diluted in TetraPropylen Hydrogen (TPH, an hydrocarbon diluent) to selectively extract uranium and plutonium towards fission products such as ruthenium, molybdenum, cesium, palladium, etc. In this process, chemical degradation of the extraction solvent and crud formation occur due to radiolysis. The main consequence of these phenomena is an alteration of the extraction properties of the solvent, especially in terms of efficiency and selectivity. Many papers report detailed qualitative and quantitative investigations of TBP-TPH degradation due to radiolysis (¹). However, very few data report the influence of the radiolysis on the palladium behaviour (^{2,3}) and show that some degraded products could interact with palladium to form either complexes or precipitates (⁴).

In this paper, the impact of the radiolytic degradation of TBP-TPH on the palladium behaviour and the formation of precipitates will be thoroughly discussed. For that purpose, a fine characterization of the precipitates formed after γ -irradiation of the biphasic system TBP-TPH//Pd-HNO₃ will be detailed.

Keywords: Radiolysis, Palladium, TBP-TPH, degradation products, PUREX process

1. Berthon, L. and Charbonnel, M.-C., in *Ion exchange and solvent extraction*, ed. B. Moyer, CRC Press Taylor & Francis Group, Boca Raton, London, New York, 2010, vol. 19, pp. 429-513.
 2. Zagorets, P. A., Smelov, V. S., Ochkin, A. V., Chubukov, V. V., Tverdokvii, A. N., Kondratev, B. A. and Kirpikov, S. V., Effect of irradiation on extraction of palladium with tributyl-phosphate from nitric-acid solutions, *Soviet Radiochemistry*, **1982**, 24, 38-42.
 3. Lunichkina, K. P., Renard, E. V. and Shevchenko, Vb, Extraction of palladium by tributyl-phosphate from nitrate and perchlorate solutions, *Zhurnal Neorganicheskoi Khimii*, **1974**, 19, 205-209.
 4. Guedon V., Étude de l'origine et des mécanismes de formation du phénomène de crasses d'interface à l'extraction du premier cycle du procédé de retraitement du combustible nucléaire irradié, *thesis*, **1993**, Joseph Fourier - Grenoble I.
-