
Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2013.808446

52 (2014) 426–431
January

Taylor & Francis
Taylor & Francis Group

Reduction of uranium (VI to IV) by hydrogenation using Adams' catalyst

Avinash Sahu, Tessy Vincent*, J.G. Shah, P.K. Wattal

Process Development Division, Nuclear Recycle Group, Bhabha Atomic Research Centre, Mumbai 400 085, India
Tel. +91 22 25595488; Fax: +91 22 25505340; email: tessyv@barc.gov.in

Received 13 April 2012; Accepted 14 March 2013

ABSTRACT

Plutonium uranium reduction extraction using U(IV) as universal reductant for Pu partitioning is the only technology practiced internationally to recover U and Pu from spent nuclear fuels. Uranous requirement of Indian reprocessing plants is met by the electrolytic reduction of uranyl nitrate with 50–60% conversion. Though the current requirement can be met with this method, it increases the load on uranium purification cycle. In addition, it is a batch process with slow kinetics. In order to achieve higher conversion of uranyl nitrate to uranous nitrate, catalytic reduction method using hydrogen in presence of Adams' catalyst (PtO_2) was tried. Parametric studies have been performed in an autoclave to evaluate the effect of U(VI) concentration, the role of hydrazine nitrate and pressure. It is observed that kinetics is improved at higher pressures. The studies revealed that near total conversion of uranium from (VI to IV) can be achieved by the catalytic reduction route.

Keywords: Uranyl nitrate; Adams' catalyst; Hydrogenation; Uranous; Reduction

*Corresponding author.

Presented at the DAE—BRNS Biennial Symposium on Emerging Trends in Separation Science and Technology (SESTEC 2012) Mumbai, India, 27 February–1 March 2012