

Transport of Cadmium Through Molten Salt to Argon Cover Gas in Electrorefiner

K.Revathy¹, S. Agarwal¹, B. Muralidharan¹, G. Padmakuma¹, K. K. Rajan¹

¹Fast Reactor Technology Group, Indira Gandhi Centre for Atomic Research, Kalpakkam, India

Abstract

Electro refining is one of the important step in the Pyro processing nuclear spent fuel with molten LiCl+KCl salt solution. The electro refiner is a process vessel consists of anode ,cathodes and stirrers and ultra -high pure argon gas is provided for inert atmosphere. A layer of 50 mm thickness of cadmium is provided at the bottom of molten salt for process requirement [Figure 1]. The vapor pressure of the cadmium is high at the operating temperature of the electro refining, the cadmium vapor transport through the molten salt solution and condenses at the argon cover gas at the top of the electro refiner which leads to the choking of components /mechanism provided at the top the electro refiner. A continuous stirring in the molten salt space also aids the transport of cadmium in the molten salt. An axi-symmetric, steady state 2-dimensional mathematical model in COMSOL Multiphysics® has been developed to study in detail the mass and heat transfer in the cadmium vapor through the salt solution and in argon gas. The diffusion and convection models have been considered for net transport of cadmium. The effect of the stirring on the diffusion rate has been studied in detail. The distribution of cadmium vapors in the covers gas space is determined from the concentration and temperature profile obtained during the analysis. This analysis will help in design of cadmium vapor trap and the locating the same in the in the argon cover gas region.

Figures used in the abstract

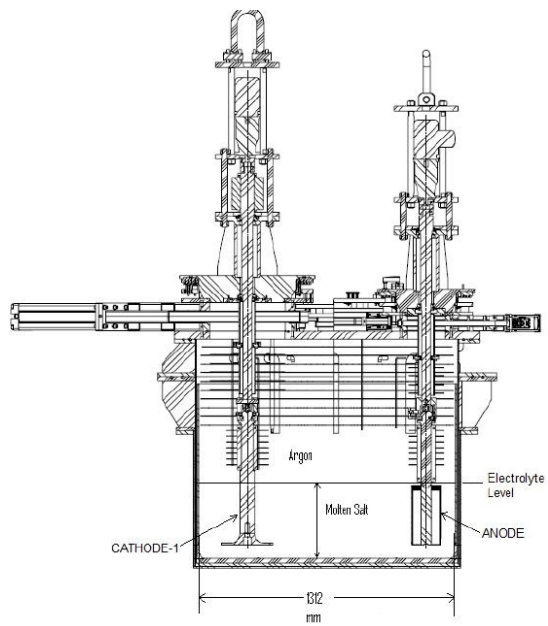


Figure 1