Salt Distiller With Mesh-covered Crucible for Electrorefiner Uranium Deposits

S.W.Kwon*, Y.S.Lee, H.B.Kang, J.H.Jung, J.H.Chang, S.H.Kim, and S.J.Lee

Korea Atomic Energy Research Institute, 111, Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon, Republic of Korea

*swkwon@kaeri.re.kr

Abstract

Electrorefining is a key step in pyroprocessing. The electrorefining process is generally composed of two recovery steps – the deposit of uranium onto a solid cathode and the recovery of the remaining uranium and TRU elements simultaneously by a liquid cadmium cathode. The solid cathode processing is necessary to separate the salt from the cathode since the uranium deposit in a solid cathode contains electrolyte salt. Distillation process was employed for the cathode processing. It is very important to increase the throughput of the salt separation system due to the high uranium content of spent nuclear fuel and high salt fraction of uranium dendrites. In this study, a mesh-covered crucible was investigated for the sat distillation of electrorefiner uranium deposits. A liquid salt separation step and a vacuum distillation step were combined for salt separation. The adhered salt in uranium deposits was efficiently removed in the mesh-covered crucible. The salt distiller was operated simply since repeated cooling - heating step was not necessary for the change of the crucible. The operation time could be reduced by the use of the mesh-covered crucible and the combined operation of the two steps. A method to preserve a vacuum level was proposed by double O-rings during the operation of the distiller with the mesh-covered crucible. After the salt distillation, the salt content was measured and was below 0.1wt% after the salt distillation. The residual salt after the salt distillation can be removed further during melting of uranium metal.