

Crucible Cover of Multilayer Porous Hemisphere for Cd Distillation

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Abstract

The electrorefining process is generally composed of two recovery steps in pyroprocessing – 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 liquid cathode processing is necessary to separate cadmium from the actinide elements since the actinide deposits are dissolved or precipitated in a liquid cathode. Distillation process was employed for the cathode processing. It is very important to avoid a splattering of cadmium during evaporation due to the high vapor pressure. In this study, a multi-layer porous round cover was proposed and examined to develop a splatter shield for the Cd distillation crucible. Cadmium vapor can be released through the holes of the shield, whereas liquid drops can be collected in the multiple hemisphere. The collected drops flow on the round surface of the cover and flow down into the crucible. The crucible cover was fabricated and tested in the Cd distiller. The cover was made with three stainless steel round plates with a diameter of 33.50 mm. The distance between the hemispheres and the diameter of the holes are 10 and 1 mm, respectively. About 40 grams of Cd and about 4 grams of Bi was distilled at a reduced pressure for two hours at 470°C. After the Cd distillation experiment, cadmium was not detected and more than 90 % of Bi remained in the ICP-OES analysis. Therefore the crucible cover can be a candidate for the splatter shield of the Cd distillation crucible. Further development of the crucible cover is necessary for the decision of the optimum cover geometry and the operating conditions of the Cd distiller.

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