Development of an integrated sieve-crucible assembly for the sequential operation of a liquid salt separation and a distillation

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Abstract

The solid cathode processing is necessary to separate the salt from the cathode for the preparation of the uranium ingot with a high purity. It is indispensable to increase a throughput of the salt removal process from uranium deposits which is generated on the solid cathode of electro-refiner in pyroprocessing [1-2]. In this study, an assembly composing a liquid separation sieve and a distillation crucible was developed for the sequential operation of a liquid salt separation and a vacuum distillation in the same tower. The feasibility of the assembly was examined by the rotation test and sequential operation of a liquid salt separation and a vacuum distillation in the distillation tower. The assembly rotated successfully with the aid of the wire connected to the pulling bar placed in the exterior of the tower without a degradation of the vacuum level by the leak. The seal was assured by double O-rings during the movement of the wire through the wall of the flange. The experiment on the sequential operation of the liquid salt separation and salt distillation was carried out using an integrated sieve-crucible assembly. The uranium deposits are placed into the sieve side of the assembly and the adhered salt is separated by heating on the sieve. Then, the uranium deposits are moved to the crucible by the rotation of the sieve-crucible assembly and the residual salt is evaporated at an elevated temperature. The remained salt in the uranium deposits was further separated further by evaporation in the distillation tower for two hours at 850 °C. The adhered salt in the uranium deposits was removed successfully. The salt content in the deposits was below 0.1 wt% after the sequential operation of the liquid salt separation and salt distillation. This residual salt after salt separation process can be removed completely during the melting of uranium metal in the following ingot preparation process. From the results of this study, it could be concluded that the efficient salt separation work could be realized by the sequential operation of liquid salt separation and vacuum distillation in one distillation tower because the operation procedure was simplified and the step of cooling and reheating was not necessary for the change of the operation mode.

REFERENCES

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