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Study on the Pride Salt Transport System for Molten Salt

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1. Introduction

Pyroprocessing technology is one of the the most promising technologies for an advanced fuel cycle with favorable economic potential and intrinsic proliferation-resistance [1]. The electrorefining process, one of the main processes composed of a pyroprocess to recover the useful elements from spent fuel, is under development at the Korea Atomic Energy Research Institute as a sub process of the pyrochemical treatment of spent PWR fuel.

High-temperature molten salt transport technologies are required because a molten salt should be transported from the electrorefiner to the electrowiner after the electrorefining process.

Therefore, in pyrometallurgical processing, the development of high-temperature molten salt transport technologies is a crucial prerequisite. However, there have been few transport studies on high-temperature molten salt [2].

In this study, a Pride salt transport system for an engineering-scale salt transport was designed and constructed for the development of a high-temperature transport technology for molten salt, and the blank and performanance tests of the apparatus were performed.

2. Pride salt transport system

A Pride salt transport system was designed and constructed for the development of high-tem - erature engineering-scale salt transport technology.

A Pride salt transport system consists of a salt ingot manufacture apparatus, a salt ingot separation apparatus, and a salt ingot charging/transport apparatus. A Pride salt transport system is shown in Fig. 1.

3. Result and Discussions

Three different salt transport technologies (gravity, suction pump, and centrifugal pump) were investigated. Among the molten salt transport methods, the suction pump transport method was selected for molten salt transport.

For the development of the engineering-scale salt transport technology, a Pride salt transport system by a suction method was designed and constructed.

Before the installation of the apparatus in an Ar cell, a shop test for a water transport experiment using the constructed apparatus was carried out as shown in Fig. 2, and the experimental results showed that water was transported well from a water contained basket to a mold vessel.

A Pride salt transport system was installed in the Ar cell of the Pride facility using a large transfer rack and a crane, in addition, pipe, electric lines, and utility lines were also installed through feedthrough in Ar cell.

The performance test of the heating and vacuum system were performed by increasing the temperature to 500℃ and reducing the pressure in the vacuum chamber to 100 mtorr.

As a preliminary study on the high temperature transport system for molten salt, several suction transport experiments using molten salt (LiCl-KCl eutectics) were also carried out.

About 2 kg of LiCl-KCl eutectic salt was prepared by mixing 99.0% LiCl and KCl and drying in a convection dry oven at 200℃ for 1 hr. A salt transport experiment was carried out at a temperature of 500℃, and a vaccum pressure range of 100mtorr~2torr. From the experimental result, about 1.54 kg of salt was transported through the transport tube from the melting reactor to the receive reactor for 60 sec. The transported salt in a mold vessel is shown in Fig. 3. From the experimental results, the possibility of high-temperature salt transport by a suction method was confirmed.

4. Conclusions

After the electrorefining process, the residual molten salt is transported to an electrowinning system to recover U/TRU/RE, a high-temperature molten salt transfer technology by suction is now being developed. A Pride salt transport system was designed and constructed for the development of high-temperature engineering-scale salt transport technology, and a performance test of the apparatus was carried out.

For basic suction transport experiments using the prepared LiCl-KCl salt, an apparatus for the suction transport experiments was also constructed, and several suction transport experiments using 2kg of LiCl-KCl eutectic salt using a constructed apparatus were carried out.

From the results, it was found that about 1.54kg of molten LiCl-KCl eutectic salt was transported in a vacuum,a range of 100mtorr~2torr at 500℃.

A Study on the development of high-temperature transport technology for molten salt is currently being carried out

Fig.1 A Pride salt transport system in an Ar cell

Fig.2. Shop test for water transport experiment

Fig. 3. Transported salt in a mold vessel

REFERENCES

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