Study of the reactivity between the ceramic material and the uranium

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1. Introduction

As a dry process for a spent fuel, such as electrorefining[1] it and withdrawing pure uranium, a uranium electodeposit is formed as dendrite phases containing a great deal of molten salt. Therefore to store uranium in the course of a recycle, there is a cathode process for producing an ingot after eliminating the molten salt in the withdrawn uranium electodeposit. To cast an elecetodeposit into an ingot, graphite crucible, due to a strong response of uranium under a molten condition, should be made by using a ceramic coating[2]. It can be also produced in the form of an ingot after being dissolved directly by using a ceramic crucible. This study has tried to coat plasma in a graphite crucible with YSZ (ytrria stabilized zirconia) which contained yttria of 8%. This is for the solution of some problems for the response between zirconia and uranium and the response between yttria and UCl_3. We also tried to coat plasma by a thermal spray in a graphite crucible with Al_2O_3 powder as a comparable material. Therefore, the direction of this study is to check the response of the used material by the stability of its thermal dynamics[3] and a practical experiment to solve the problem of a reduction of uranium caused by a response of UCl_3 to a ceramic material and a uranium production of a low concentration by becoming mixed with carbon in a graphite crucible.

2. Experiment and procedure

The same graphite plate used as a graphite crucible material was used as a matrix for a coating usage. The graphite material is the isotropy material of R4340 purchased from Dong-Bang carbon Company. It's the size was 20mm x 20 mm x 5mm. YSZ used as a coating powder of the plasma was METCO 204NS and the particles size was from 11 to 125 ㎛. The Al_2O_3 used as a comparable material was a powder from Fujisi Surprex AHP60 99.9% and the size of it was from 3 to 125 ㎛. Fig. 1 is the front diagram and the design plan of the graphite crucible used as an induction furnace at a high temperature and high frequency. It is made with a coated plate material which contained five types of 2 couples according to each thickness. The experiment for the response between the coated material and the uranium was kept for one hour at 1300℃ and further, we carried out an additional experiment in the range of the temperature which was from 1350 to 1450℃ for two hour.

The samples used for the experiment for the response are SEM/EDX of JEOL 6300. Each response layer and ingredient was analyzed. XRD was used to evaluate the change of an aspect of the powder for a coating usage and a coating layer.

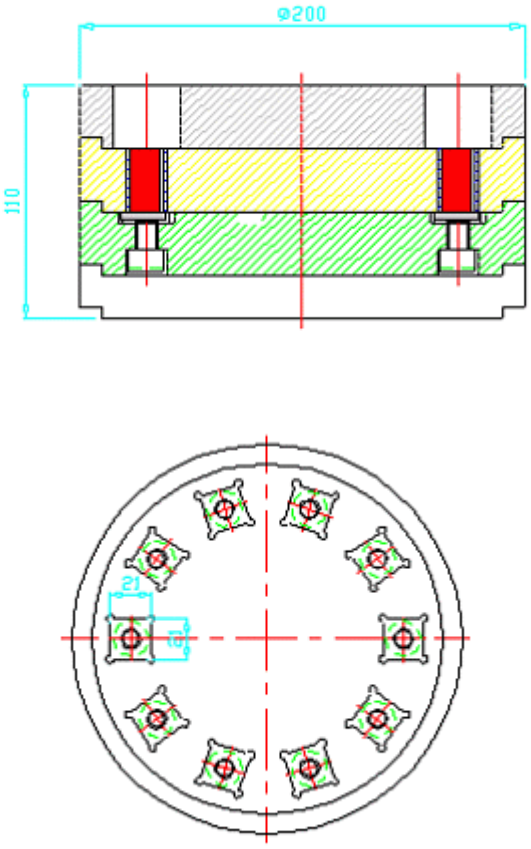

Fig. 1 The diagram of graphite crucible for the response between the coated material and the uranium.

3. Conclusion

Consequently, in the experiment for the response with uranium after coating YSZ on the graphite, the coating layers are maintained but most of the layers of alumina are far from the graphite. It is considered that this is because the adherence was weaker than that of YSZ with a phase change of the alumina.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial support of The Korean Ministry of Education, Science and Technology.

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