Solidification of metal oxide from electrokinectic-electrodialytic decontamination

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1. Introduction

A total of 12,400 drums of uranium soil waste from the decommissioning of a uranium conversion facility are stored at KAERI [1]. Electrokinectic-electrodialytic decontamination technology reduced 80% of the concentration of the uranium soil waste to below the concentration of self-disposal. After conducting electrokinectic-electrodialytic decontamination, more than 10% of the remainder of radioactive waste from the cathodes of electrokinectic-electrodialytic equipment were produced. To dispose of such waste, it is necessary to solidify second radioactive waste owing to the requirements of radioactive waste from public corporations [2-7]. In this study, a solidification experiment was carried out using a polymer. At first, a sampling of second radioactive waste was conducted. Then, second radioactive waste and a polymer were mixed. Third, the solidified state between the second radioactive waste and polymer was checked. In our next study, an experiment for the requirements of a public radioactive waste corporation will be conducted.

2. Experiment

As shown in Figure 1, powder of second radioactive wastes on an electrokinectic-electrodialytic cathode was prepared. According to Table I, the specimen of the powder was prepared using the total weight (50g) of both the metal oxide and polymer, as shown in Figure 2. The polymer was also prepared as shown in Figure 3. The mixing between the powder and polymer was prepared as shown in Figure 4.

The solidified state between the metal oxide and polymer were checked every 10 days for up to 1 month.

Fig. 1. Powder of metal oxide.

Table I: Experimental conditions

Specimen	Polymer	Metal oxide
P-1	55% (27.5g)	45% (22.5g)
P-2	45% (22.5g)	55% (27.5g)
P-3	35% (17.5g)	65% (32.5g)

Powder of the metal oxide of second radioactive waste was prepared at 45, 55 and 65 wt% of the total 50g weight, as shown in Figure 2. The polymer used for solidifying the powder of metal oxide of the second radioactive waste was prepared at 55, 45 and 35 wt% of the total 50g weight, as shown in Figure 3.

Powder of the metal oxide of the second radioactive waste and a polymer were uniformly mixed, as shown in Figure 4.

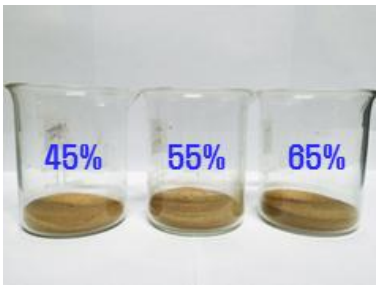

Fig. 2. Powder of metal oxide.

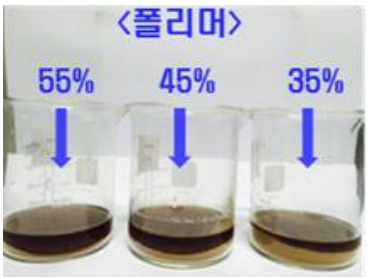

Fig. 3. Polymer for solidification.

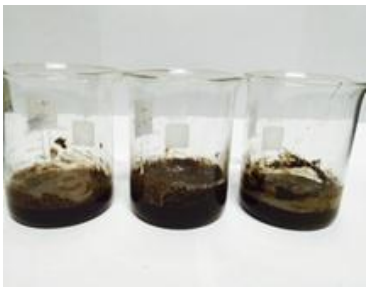

Fig. 4. Mixing of powder of metal oxide and polymer.

3. Results and Planning

Figures 5 through 7 show the solidified states of the powder of metal oxide of the second radioactive waste and polymer. Figure 5 shows the results from 10 days after solidification. The solidification process occurred without external changes such as cracks. Figure 6 shows the results from 20 days after solidification. 70% of the solidification process occurred without external changes such as cracks. Figure 7 shows the result for 30 days after solidification. 80% of the solidification process occurred without external changes such as hair-like cracks. The polymer is considered a good binder for solidifying the powder of metal oxide of second radioactive wastes.

In our next study, if the solidification between the powder of metal oxide of second radioactive waste and the polymer is finished, we are going to conduct a test for inspecting the integrity of the pressure intensity on a solidified specimen.

Fig. 5. Solidified state after 10 days.

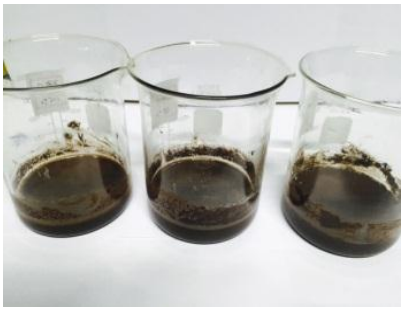

Fig. 6. Solidified state after 20 days.

Fig. 7. Solidified state after 30 days.

4. Conclusions

To dispose of second radioactive wastes from electrokinectic-electrodialytic decontamination, a solidification experiment was carried out using a polymer. The solidification process occurred without external changes such as cracks after 10 days of solidification. 70% of the solidification process occurred without external changes such as cracks after 20 days of solidification. 80% of the solidification process occurred without external changes such as hair-like cracks after 30 days of solidification. A polymer is considered a good binder for solidifying the powder of metal oxide of second radioactive wastes.

In our next study, if the solidification between the powder of metal oxide of second radioactive waste and the polymer is finished, we are going to perform a test to inspect the integrity of the pressure intensity on the solidified specimen.

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