Study on Vitrification for Rare Earth Waste

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The vitrification using borosilicate glass system for rare earth waste, including Y, La, Ce, Pr, Nd, Sm, Eu, Gd, etc, is studied. The optimized glass exhibited viscosity of 7.2 poise and an electrical conductivity of 1.13 S/cm at a melting temperature 1200 ^{o}C so that operating variables within the CCIM were evaluated to be very favorable.

Keywords: Vitrification, Rare earth waste

1. Introduction

The rare earth oxide wastes consisting of major 8 nuclides Y, La, Ce, Pr, Nd, Sm, Eu, and Gd, are generated during the salt waste treatment of PyroGreen Process. The rare earth wastes are generated as an oxide form. In this study, candidate glass for rare earth waste was developed to evaluate the feasibility for vitrifying the rare earth oxide wastes within the borosilicate glass system.

2. Vitrification of rare earth wastes

2-1. Experiment procedure

The candidate glass, which satisfies the glass quality, volume reduction ratio, and operation parameter under program calculation, is fabricated at 1,200 ^{o}C. The ternary diagram was adopted to achieve the best glass quality, optimum operation parameter, and highest volume reduction ratio. The four different types of base oxide materials, including B_2O_3, Li_2O, Na_2O, and SiO_2, were selected for the optimization of the glass composition. The amount of the composition was controlled to achieve the reasonable chemical durability and operation parameter, such as viscosity and electrical conductivity.

2-2. Properties of fabricated glass

The surface and microstructure of the fabricated glass, coated with Au for analysis, for the rare earth waste were analyzed using the SEM/EDS. The fabricated glass exhibited good uniformity without generation of secondary phase and/or crystal, as shown in Figure 1. Also, fabricated glass exhibited good operation parameter and chemical durability, such as viscosity of 7.2 poise and electrical conductivity of 1.13 S/cm.

Figure 1. Photo (left) and SEM (right) images of fabricated glass for vitrification of rare earth wastes

3. Conclusion

The glass composition for vitrification of rare earth waste is studied. The suggested glass exhibited good uniformity, without any secondary phase and/or crystal, and reasonable operation parameter, including viscosity and electrical conductivity.