

Utilizing Glass Frits to Vitrify Low-Level Radioactive Waste from Korean NPPs

Kwansik Choi, Byung Chul Lee, Jong Kil Park, and Myung-Jae Song
Nuclear Environment Technology Institute
Korea Electric Power Corporation

Abstract

Vitrification has been considered as an integrated, cost effective, and environmentally sound solution for low-level radioactive waste (LLW) generated from nuclear power plants (NPPs) in Korea. Korea is in the process of preparing for its first ever vitrification plant to handle LLW from her NPPs. As a part of this project, Nuclear Environment Technology Institute (NETEC) has finished its pilot plant construction and test operation as well as preliminary selection of glass formular for the different waste streams. Nepheline and window glass are glass frits which has been considered to vitrify combustibles from Korean NPPs. Utilizing one glass frit to vitrify different waste types with variable compositions is a topic of this project. This paper presents the test results of utilizing the two glass frits to vitrify low-level radioactive waste from Korean NPPs. The waste streams include three categories, combustible Dry Active Wastes (DAW), borate waste, and spent resin. Considering chemical durability and viscosity, it is found that the Nepheline and Window Glass can be used as chemical additive to vitrify mixtures of combustible DAW and spent resin up to 40~50 wt% of waste loading. Window Glass allows waste loading of 30~40 wt% for mixtures of combustible DAW and borate waste while maintaining good durability and viscosity. In this study, durable glass is defined as 5 g/m² of total mass loss after 7day at 70 deg-C using modified Product Consistency Test (M-PCT) and acceptable molten glass viscosity as 10~100 poise.