

Long-Term Leaching Test of 200L Cemented Waste Drum Incorporated Spent Filter

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The static leach test of spent filter drum produced in Young-Kwang NPP(0.6 mSv/hr) was carried out in a hot cell of the Radioactive Waste Form Characterization Facility (RWFCF) in KAERI. A lid-opened waste drum after decontamination of the drum's outer surface was immersed into a leach vessel, which contained 237 L of deionized water, equivalent to 10 times the surface area exposed in leachant. Deionized water with an electrical conductivity of less than 3.41 mho/cm was used as a leachant. The test temperature was constantly kept at 20°C in the hot cell. A leachate of 500 ml was periodically sampled a through timer-attached solenoid valve during the circulation of the leachate by a low flow rate pump. After an analysis of the radioactivity, an analyzed leachate was refilled into the leaching vessel. The amount of Cs-137 and Co-60 in the leachate was analyzed by γ -ray spectroscopy using a HPGe 25190-P detector. The effective diffusion coefficient of radionuclide of waste form (diameter/height \neq 1) was determined by semi-infinite diffusion model.

The results of the pH and conductivity during 247 days of the leaching test were shown in Fig. 1. The range of pH and conductivity were 7.17 ~ 12.97 and 3.41 ~ 4,950 μ S/cm, respectively. The pH and conductivity rose sharply in the first leaching day and then rose gently according to the increase of leaching time.

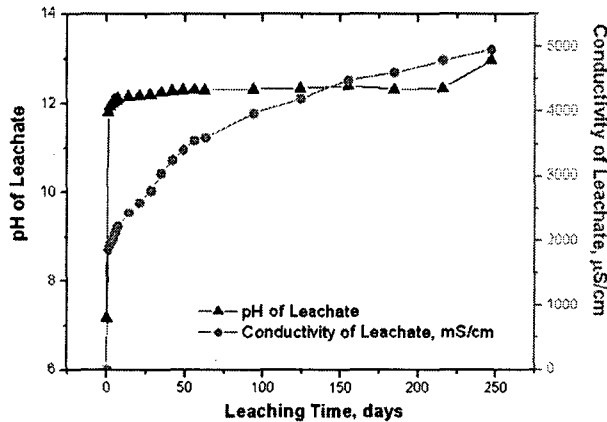


Fig 1. pH and Conductivity of Leachate

The relationship between the activity of Cs-137 in leaching vessel and the square root of leaching time is shown in Fig. 2. The black points represent the activity of Cs-137 in leaching vessel and the red points represent the change of the activity before and after the sampling of leachate. The activity curve (or cumulative fraction leached curve) showed two

modes such as a rapid release and a more slow release before and after the 49 days' leaching time. The leaching mechanism of radioactive nuclides from a cemented waste form was typically interpreted by diffusion as the expectation.

The activity of Co-60 in leaching vessel showed in Fig. 3 according to the function of the square root of leaching time. The black points represent the activity of Co-60 in leaching vessel and the red points represent the change of the activity before and after the sampling of leachate.

The leaching behavior of Co-60 from a cemented waste form was expected similar to that of Cs-137, but as shown in figure 4 the behavior did not show the diffusion mechanism. On the contrary, there were no changes in the activity of Co-60 during the leaching time. It could be the reason that the salt of Co is insoluble and the filter captured the salt of Co, tightly.

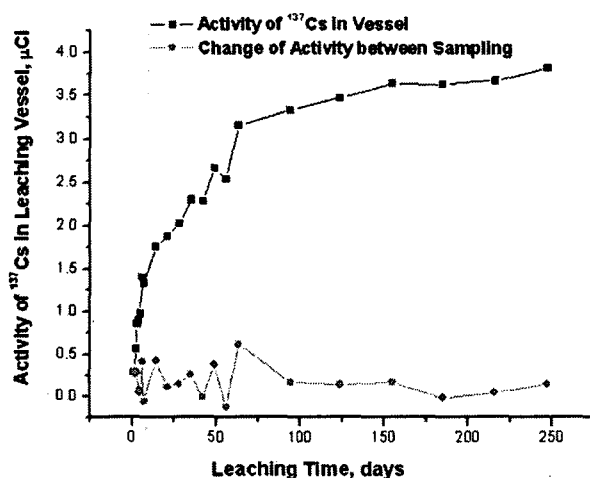


Fig. 2. Activities of Cs-137 in Leaching Vessel

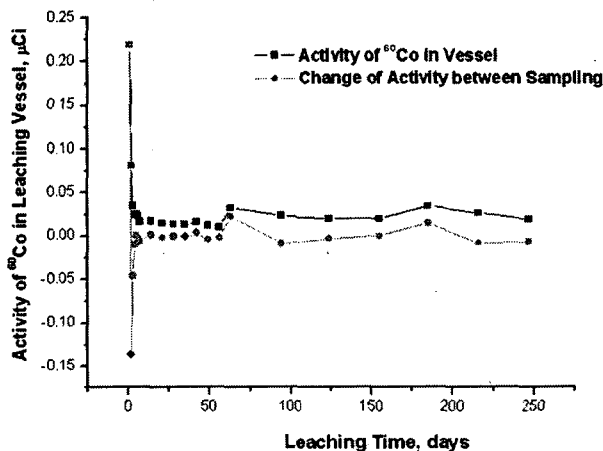


Fig. 3. Activities of Co-60 in Leaching Vessel