Formation of a secondary phase on the leached waste glass in contact with bentonite under synthetic granitic groundwater

Kwan-Sik Chun, Seung-Soo Kim and Jong-won Choi
Korea Atomic Energy Research Institute, 150 Duckjin-dong, Yuseong-gu, Daejeon

Extended Abstract

In the KAERI, the long-term dissolution experiment of waste glass under a repository condition has been carried out since October of 2001. The purpose of this experiment is to identify what kinds of secondary phases could be formed on the glass in contact with the compacted bentonite blocks with their density of 1.4Mg/m^3 under a synthetic granitic groundwater and to support the release mechanism of radionuclides from a waste glass in the near field.

The domestic Ca-bentonite block was filled into the under-part of a leaching cell (30mmϕ x 33mm, internal dimension) and the waste glass specimen (18mmϕ x 3mm) was mounted on these blocks and then the under-part was bolted with the upper-part in which only the compacted bentonite block was filled. And the other leach cell was filled with Kunigel V1 Na-bentonite blocks. The synthetic granitic groundwater continuously passed through the two kinds of leach cells. After a certain period of these leaching, each cell was dismantled, the leached glass was taken out from the cell and then the specimen surface was washed out with demineralized water to remove the remained bentonite deposited on the surface. And the washed specimen was analyzed by using XRD and EPMA.

The XRD patterns of the waste glasses before and after their leaching are illustrated in Figure 1, including the XRD pattern of the Na-bentonite. New phase was identified on the surface of the waste glass in contact with the Na-bentonite block as a cerium carbonate hydroxide. However, any new phase was not identified on the glass surface in contact with the Ca-bentonite.

By the EPMA results of the leached glasses shown in Table 1, the surface area of the glass in contact with the Na-bentonite except white spots was covered mainly with Ce and Nd, while the other with the Ca-bentonite was covered with Zr and the same components. But these amounts were much lower than that with the Na-bentonite.

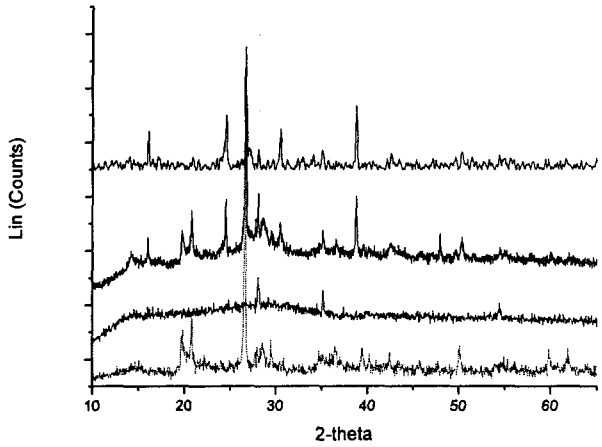
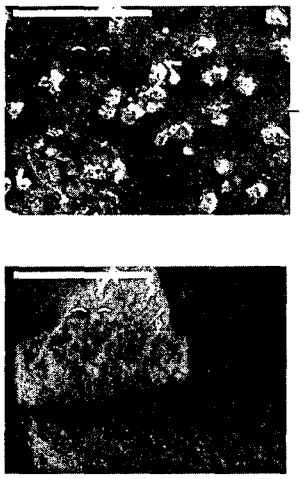


Fig. 1. XRD patterns of waste glasses before and after leaching, and Na-bentonite



	Initial value	1169 days		
	(wt.%)	(J)A	(J)B	(K)
Na	16.59	3.40	1.06	1.36
Al	5.80	15.91	2.11	6.81
Si	47.69	44.53	13.05	19.92
Mo	2.12	6.60	5.85	1.52
Ca	4.70	2.16	4.00	4.98
Fe	3.12	2.65	2.81	5.38
Zr	2.37	0.00	0.00	22.96
P	0.19	0.00	2.79	1.62
Cs	1.55	0.00	0.00	0.00
Nd	2.59	11.48	34.31	15.04
Ru	1.53	0.00	0.00	0.00
Mn	0.51	0.10	0.26	1.71
Ce	5.98	9.52	31.28	18.41
Zn	5.28	3.66	2.49	0.29
Total	100.00	100.00	100.00	100.00

Table 1. EPMA results of the leached glasses