Evaluation of Microscopic Structure of Cement Solidification Mixed with zeolite

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In the Fukushima first Nuclear Power Plant, a large quantity of radioactive contaminated water is caused by an accident. They decontaminated the cesium included in this contaminated water by adsorbing to zeolite. Now, the zeolite which adsorbed cesium is kept as second waste, and it is demanded that it establish a method of the last disposal. For the establishment of the disposal method, it is necessary to consider containment ability, dynamic stability and economy. Because the cement solidification technology has the result of the underground disposal of the low-level radioactive waste, the technology is considered to be one of the suitable choices as the method that can satisfy this consideration item enough. In this study, for the possibility consideration of the cement solidification technology, we evaluated the mass transfer resistance and microscopic structure of cement solidification mixed with zeolite.

The specimen took high temperature curing to simulate pyrogenic. Curing temperature is 20, 50 and 80 degrees, and Curing period is one month and three months. The experimental that I carried out is an electrophoresis in conformity with JSCE-G571. In addition, concerning the information on the effective diffusion coefficient (De), the measurement of the pore size distribution using mercury intrusion porosimetry and the estimate of the amounts of calcium hydroxide by TG-DTA.

As a result of experiment, the De of the cement solidification mixed with zeolite was smaller than normal mortar in high temperature curing. It is thought that this causes the chemical reaction that resembled a pozzolanic reaction by zeolite. In addition, the De of specimen which added fly ash showed an extremely low value of the 1E-13 m^2/s order in high temperature curing. Therefore, we confirmed that the high temperature curing promoted a pozzolan reaction and led to mass transfer resistance improvement by adding fly ash. However, the result of the pore size distribution did not provide consistency with the De. For this reason, it is thought that the existence of the void which does not influence De and a microscopic structure changes by heat addition.