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# Local structural analysis of fission products attached to reactor structural materials

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## 1 Introduction

For decommissioning of the Fukushima Daiichi Nuclear Power Station, it is necessary to manage the dismantling wastes safely and rationally. In order to understand the penetration mechanism of radioactive species in the structural materials, the penetration of two types of constructive confrontation solution and the EXAFS characterization of species after penetration have been carried out, and the variation of the coordination environment depending on the amount of aggregates has been identified.

## 2 Experiment

EXAFS measurements have been performed on concrete with different aggregate content that was subjected to Cs penetration test in High Energy Accelerator Research Organization Photon Factory BL-27B by transmission and fluorescence modes. A concrete test piece has been immersed in aqueous 1 M CsCl or CsI solution for 1 day was cut by 2.0 mm from the surface using sandpaper in each 0.5 mm, and the concrete powder obtained was focused on the $CsL_{III}$ absorption edge. We have compared the structural functions depending on concrete type and immersed solution.

## 3 Results and Discussion

Figure 1 shows the structural functions of concretes with different aggregate type, larger and finer aggregates after immersion test using CsI, and Fig. 2 shows Cs penetration depth of the concretes with different aggregate type. As shown in Fig. 1, structural function has been varied depending on the type of aggregates. In particular, the peak size of CsI decreases around 4 Å in finer aggregates, which is due to decrease of contribution of CsI molecules. It is conjectured that a gap created between the cement and the aggregate exists and CsI solutions penetrates through it in the concrete with larger aggregate, while Cs ions penetrate in the concrete with finer aggregate. The amount of aggregate is considered to strongly influence on the evaluation of Cs infiltration into concrete.

Moreover, focusing on the peak size of larger and finer aggregates samples around 2 Å in Fig. 2, which is the interatomic distance between Cs and O tends to increase as it gets deeper from the surface. Furthermore, the increase degree of distance increases in the case of larger aggregates.

We are planning to do fitting to obtain detailed structural parameters. In addition to the amount of aggregate variation, it is thought to be a factor that influences the coordination with oxygen in the concrete and the interatomic distance, as well as the change in the penetration depth of Cs.

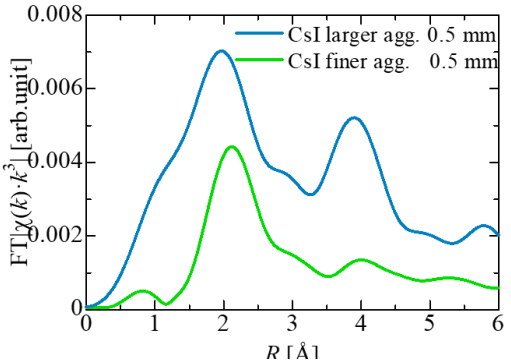


Fig. 1 Structural functions of concretes with different aggregate type after immersion test using CsI.

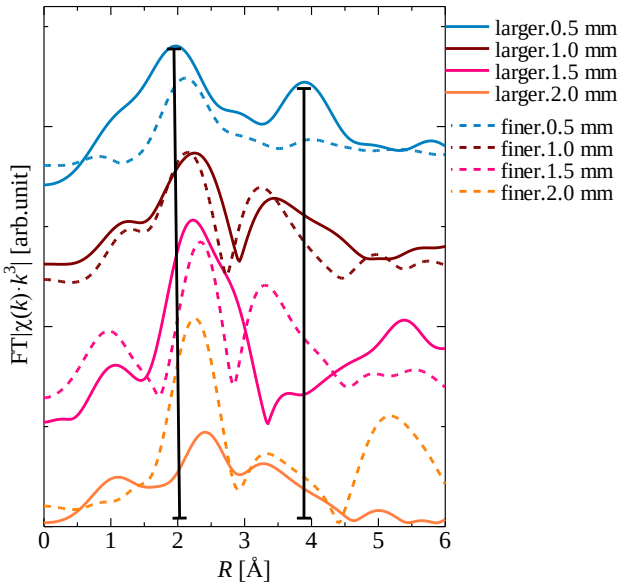


Fig. 2 Structural functions of concretes of different penetration depths after immersion test using CsI.

## References

[1]Y.Takahashi et al,Surface science,.34(3),pp.122(2013)

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