Cesium Chemisorption Behavior onto Structural Material under Severe Accident Conditions
(5) Progress on microstructural analyses

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This work will compare the microstructural results obtained from different Cs-chemisorbed stainless steel (SS) samples (SS304 and modified-SS316). The analyses showed that Cs-chemisorption was influenced by the presence of different minor elements in SS (such as Si and Mo), as the deposits on the samples exhibited different properties.

Keywords: Chemisorption, Severe Accident, Stainless steel, CsOH

1. Introduction

Following a severe accident (SA) information on the distribution, composition and properties of radioactive Cs deposits onto structural materials are important for the decommissioning, as for example for the Fukushima Daiichi Nuclear Power Plant. Moreover these information can enhance the description of chemisorption models applied in SA codes, thus improving their source term assessment. In our experiments CsOH was vaporized over different SS samples (SS304 with different Si contents, and modified-SS316 with Mo inclusion). The deposits formed were analyzed by various post-analyses to understand their characteristics (chemical form, amount, microstructure, and thermal stability) [1].

2. Results

While our chemisorption experiments on SS304 samples have shown the formation of $CsFeSiO_4$ [1]. The new analyses performed on modified-SS316 samples showed that the presence of Mo in SS can affect strongly the chemisorption mechanism. The formation of not only $CsFeSiO_4$, but also of Cs_2MoO_4 (Figure 1) was observed on these samples. Cs_2MoO_4 was moreover formed only in the tests at low temperature (800 °C). Finally high temperature tests (at 1000 °C) were performed to observe the Cs deposits stability. These tests indicate that Cs deposits can be partly vaporized at high temperatures.

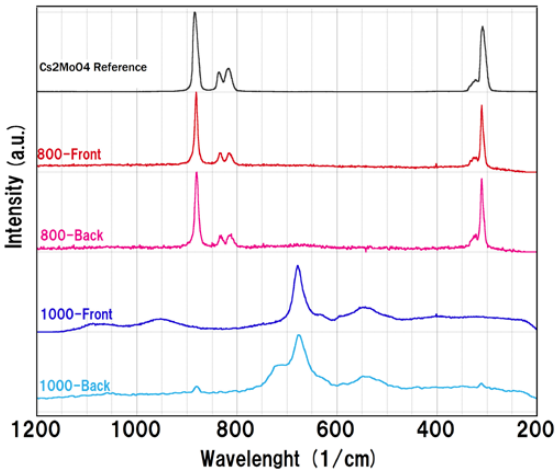

Figure 1- Raman spectra on SS316 confirming the formation of $CsFeSiO_4$, but also of Cs_2MoO_4.

3. Conclusions

The experiments demonstrated that also minor elements present in structural materials can affect strongly Cs-chemisorption mechanism, in particular the deposit chemical form and properties. The high temperature tests showed that Cs deposits are not stable at high temperatures. This can explain the observation in our tests of a smaller Cs deposited amount at 1000 than 800 °C. Finally these experiments demonstrated that Cs_2MoO_4 is a less stable compound with respect to $CsFeSiO_4$ at high temperatures.

References

[1] Di Lemma F.G et al., "Cesium Chemisorption Behavior onto Structural Material under Severe Accident Conditions (2) Microstructural study of Cs-chemisorbed stainless steel" *Proceeding in AESJ Fall Meeting 2015*, 2015-9-9, **J14**.