Validation and Verification for the multi-physics models in JUPITER code

*Penghui Chai[1], Susumu Yamashita[1]
[1]Japan Atomic Energy Agency

Abstract:

Various numerical simulations were performed by JUPITER code in order to validate the reliability of its multi-physics models, which were developed for evaluating the melting and relocation behavior of the core materials. By comparing with the previous experimental results, we could conclude that JUPITER code is a useful tool on severe accident analysis.

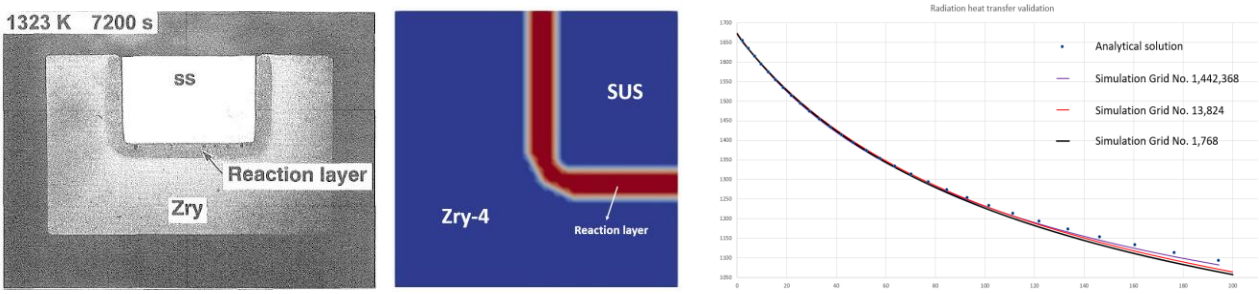
Keywords: JUPITER code, multi-physics models, code validation.

1. Introduction

The objective of this research is to confirm the reliability of JUPITER code [1] on analyzing the severe accident phenomena. In this study, multi-component eutectic reaction and radiation heat transfer models were validated based on the previous research [2].

2. Results discussion

The eutectic reaction model was validated by solving diffusion problem for both binary (JAERI test for SUS304-Zry4 system) and ternary systems (CBFCBE test series). As it shown in Figure 1 (a), current eutectic model was able to properly reproduce the solution resulted by eutectic reaction. In addition, Radiation heat transfer model was validated against the analytical solutions, and the sensitive analysis was also conducted (Figure 1 (b)). We could conclude from the results that the higher resolution leads to the higher accuracy of the result. Moreover, QUENCH-05 test was also simulated to validate the reliability of JUPITER on simulating the comprehensive heat transfer behavior of bundles, and the tendency matches good with the experimental results.



(a) (b)

Figure 1. (a). Comparison of reaction layer's formation in JAERI test; (b) Validation of the radiation heat transfer model.

Acknowledgement

Part of this study was performed in the framework of "Advanced Multi-Scale Modelling and Experimental Tests on Fuel Degradation in Severe Accident Conditions", which supported by Ministry of Economy, Trade and Industry, Japan.

References

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