Introduction

- Oxide dispersion strengthened (ODS) Zry-4 cladding
  - One of the candidates for ATF in KAERI
  - A laser beam scanning (LBS) has been employed.
  - Effective way to increase the strength of Zry-4 cladding
- Ballooning phenomenon of multi-layered cladding
  - Analysis by using creep strain has been performed to evaluate the cladding large deformation.
  - Creep strain rate is described in the form of the Arrhenius equation.
  - Coefficients of a multi-layered cladding are hard to measure by using conventional test methods.
- DIMAT burst tests are performed and the creep coefficients of an ODS cladding are derived.
- These coefficients are applied to FRAPTRAN-KATF which creep-based large deformation module is installed and compared with ODS test results.

Burst tests using DIMAT and transient analysis

- Burst tests and creep coefficients of ODS cladding
  - It is assumed that F, G, H are 0.5, because more random microstructure is formed than as-fabricated claddings during ODS manufacturing process.
  - The creep coefficients of a ODS cladding is estimated by using the measured real-time data.
  - The rupture occurs at the temperature about 1.075 times higher than the Zry-4.
  - It is needed to obtain anisotropic coefficients with uniform ODS claddings if possible.
- Transient analysis of ODS cladding using FRAPTRAN-KATF
  - The large deformation evaluation module based on the creep model, Mo thermal conductivity, CrAl oxidation models and ODS mechanical properties are applied to FRAPTRAN-2.0 for ATF safety evaluation.
  - FRAPTRAN strain limits are used to predict failure in ballooning.
  - Creep-based large deformation model is more consistent with the physical phenomenon than original FRAPTRAN large deformation module, BALON2.

Conclusion

- To obtain the creep coefficients for ODS cladding, DIMAT tests were performed.
- Creep-based large deformation module with them was well simulated a ODS cladding burst test.
- As a result of the analysis, although the time of failure is delayed, the strain according to time is well predicted.
- In the future, it is needed to establish stress and strain limits for ATF claddings.

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