

Derivation of LOCA ductility limit from AEKI ring compression tests

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ABSTRACT

Ring compression tests with Zircaloy-4 and E110 cladding had been performed several years ago at the KFKI Atomic Energy Research Institute, the main results were published earlier. The present paper describes a new evaluation of experimental data and derivation of LOCA ductility limit for E110 and Zircaloy-4 claddings using the methodology proposed in by C. Vitanza.

The evaluation of different parameters from the load-displacement curves showed strong connections between relative deformation, residual ductility and energy at failure and it was concluded that any of them could characterize the ductile-brittle transition. The specific energy at failure can help in the comparison of experiments carried out with different sample length, furthermore a similar parameter is used for the evaluation of reactor vessel steel embrittlement. For these reasons the specific energy has been selected as indicator for ductile-brittle transition. Its threshold value (50 mJ/mm) was determined on the basis of qualitative differences observed in the load-displacement curves. The ductility limit curves were determined on the basis of ring compression data, using the 50 mJ/mm specific energy threshold for the separation of *intact* and *failed* samples. Their expression determines a relationship between the oxidation time and oxidation temperature. No failure can be expected during the LOCA transient if the oxidation time is less at a given temperature, than the limiting value given by the expression.