Contribution ID: **29** Type: **not specified**

Towards improved measurement capabilities and better understanding of the thermo-physical properties of nuclear materials

Thursday 7 November 2019 11:40 (20 minutes)

The thermo-physical properties of nuclear materials govern the operational and off-normal behavior of a nuclear reactor. It is, thus, necessary to be able to accurately measure and understand these material properties. Frequently, nuclear materials available for examination may be scarce and could come in non-ideal geometries (e.g. fuel fragments or curved cladding specimen). The asymmetry of the sample geometry challenges the accuracy of conventional measurements of thermal diffusivity and conductivity (using techniques as the laser flash method). Hence, in this study the effects of a curved geometry would be examined on the measurements of thermal diffusivity, thermal conductivity and specific heat via the laser flash technique. For this purpose a 3-D finite element model is developed which simulates the heat transfer in a curved Zircalloy cladding segment. The model is used to produce synthetic data which mimics the experimental data obtained during a laser flash experiment. Subsequently, an axisymmetric (2-D cylindrical geometry) model is built approximating the 3-D cladding geometry while conserving volume. The thermal properties (specific heat and thermal conductivity) of the 2-D model are optimized to obtain a minimal least square difference between the 2-D output and the synthetic 3-D data. This has been done over a range of temperatures. Correction factors are established as a function of temperature. Depending on the surface on which 3-D data is calculated (convex or concave) the correction factors differ.

Author: PAVLOV, Tsvetoslav (Idaho National Laboratory)

Presenter: PAVLOV, Tsvetoslav (Idaho National Laboratory)

Session Classification: Session 10