**Comparison of Raman Thermometry Techniques for Thermophysical Properties of Uranium Dioxide**

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Raman thermometry has been used to determine the temperature of materials based on an observed Raman shift, which is then used to determine the sample's thermal conductivity from a measured response of the Raman signal during heating. Because Raman thermometry is a high resolution, contactless technique, there has been increased interest in its use in the development of new nuclear fuels. The thermal conductivity of uranium dioxide, used as fuel in US nuclear plants, has traditionally been measured using "laser flash", embedded thermocouples, or most recently thermal reflectance. Spatially resolved, optically-based techniques like thermal reflectance require a thin metallic transducer layer on the surface of the material of interest, while Raman thermometry does not need this additional requirement. In previous work, Raman models have been used to characterize defects in uranium dioxide, and Raman thermometry has been used for silicon, but Raman thermometry has not been used to characterize the temperature rise and thermal conductivity of uranium dioxide. This work simulated the use of Raman thermometry to measure the thermal properties of uranium dioxide by Raman thermometry techniques commonly used with thin films or extended silicon structures. These are then compared to a thermal wave based technique. The simulations investigated the effects of the inclusion of radiation heat losses based on film, extended surface, and thick plate geometries and were consistent with literature results. The simulations were then run with the properties and Raman spectra of uranium dioxide. The sensitivities of each method are compared for the future use of Raman thermometry with uranium dioxide.