ARWIF Abstract:

Title: Advanced characterization methods for TRISO fuels

Abstract:

Particle fuel characterization can be improved using modern technology, international historical experience, and recent insights into the relationship between fuel properties and performance. Modernized characterization methods can better monitor fuel quality and can aid in the development of advanced fuels. Ongoing research at Oak Ridge National Laboratory focuses on updating fuel characterization methods to properly qualify TRISO fuels for testing at the Advanced Gas Reactor (AGR) and to establish a new standard for particle fuel characterization in the US. Computer automated microscopy and analysis have allowed for particle size and shape information to be easily and accurately measured for large samples sizes. A Fourier transform analysis method has been developed that allows for both overall and localized measures of particle shape that will be more suitable for modeling structural failure mechanisms than the commonly reported aspect ratio. Layer thickness analysis provides average layer thicknesses based on hundreds of thickness measurements per particle and accurate determinations of measurement uncertainty. Preferred orientation in the pyrocarbon layers is being rigorously measured by sophisticated ellipsometry methods. Density column procedures have been refined based on a physical understanding of the underlying mechanisms. Modern microwave digestion methods are being applied to supplement traditional Leach-Burn-Leach measurements.