

NUCLEAR ENERGY UNIVERSITY PROGRAMS

Millimeter-Wave Thermal Analysis Development and Application to Gen IV Reactor Materials

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Abstract

The main objectives of this project are 1) develop a new non destructive evaluation (NDE) thermal analysis capability using novel millimeter-wave (MMW) techniques and technologies, 2) apply the new thermal analysis technology to carry out studies of material properties of graphite, ceramic composite components, and metal alloys, and 3) develop structure-MMW properties relationship for structural and fuel components necessary to the development of the Next Generation Nuclear Plant (NGNP). Researchers will obtain new data at extreme temperatures up to 1500°C (potentially extended to 2000°C) on material transitions that impact durability, corrosion, reactivity with temperature, interactivity with other materials, and thermal cycling. They will carry out comparisons with existing models and formulate new models for materials characterization that can be used in environments that have previously been inaccessible to reliable measurements. This will also lead to new sensor technology that can be used to rapidly screen materials in working environments and for monitoring the health and safety of a reactor during operation.