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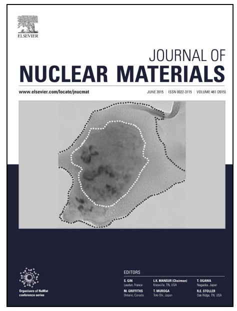

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Implementation of a multilayer model for measurement of thermal conductivity in ion beam irradiated samples using a modulated thermoreflectance approach

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Laser based modulated thermoreflectance (MTR) technique is an attractive method for measuring thermal conductivity in ion irradiated samples. Unlike laser flash analysis, traditionally used for measuring thermal conductivity in nuclear materials, the MTR method is sensitive to damage that is only a few micrometers thick. This allows MTR to detect damage resulting from a few MeV ion beam irradiation. MTR combined with tailored ion beam irradiations offers a promising opportunity for validation of lower-scale thermal conductivity models developed for irradiated materials. In this technique, a harmonically modulated laser pump heats the irradiated sample and a probe beam measures the temperature induced changes in the sample's reflectivity. Interpretation of the measured temperature profiles in ion irradiated samples is complicated by the nonhomogeneous damage profile and the presence of an additional thin metal transducer layer. In this work, we present a detailed analysis of the experimentally measured thermal wave profiles in UO_2 samples irradiated with 2.6 MeV H^+ ions using different multilayer approximations of the damaged region. The limitation of an infinite damage layer approximation that assumes uniform damage across the thickness of the sample and neglects the undamaged region is discussed. Presented analysis outlines the method for determination of the applicability range for the infinite damage model. Finally, an analysis of the