

DEVELOPING A NON-DESTRUCTIVE EVALUATION TECHNIQUE USING RESONANCE ULTRASOUND SPECTROSCOPY FOR FISSION BASED TARGET

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ABSTRACT

The purpose of this thesis is to study Resonance Ultrasound Spectroscopy (RUS) and its potential to study the change in mechanical properties of a fission based target. Fission based target goes through a number mechanical property changes. Elastic constants, contact pressure are the major focuses of this research. Resonance Ultrasound Spectroscopy is conventionally used to determine the material properties of elastic bodies. It is a nondestructive testing that is very capable of extracting the elastic constants for a complete anisotropic material. Finite Element Method (FEM) is used to determine the natural frequency of a hollow cylinder. An experimental system was developed to capture the resonant frequencies of a hollow cylinder which is similar to Molybdenum-99 target. Resonance spectra is measured and the frequencies were inverted to elastic constants using the finite element model. Neutron radiation damage on elastic constants was studied. An investigation was made to assess the usefulness of RUS in contact pressure measurement. The result on the contact pressure measurement provides a qualitative way to distinguish between the different contact pressures.