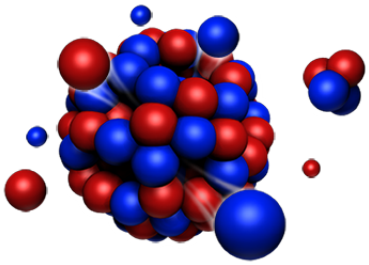

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Two Methods for Measuring Residual Strain in ISIS Target Plates

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Tantalum-clad tungsten targets are a popular choice for spallation neutron production, due to the combination of high neutron yield and corrosion resistance. Such targets typically use the Hot Isostatic Press (HIP) method to bond the cladding to the core; this produces a strong bond but also introduces large residual stresses in the target and cladding. This is a particular concern because cladding failures are currently believed to limit the lifetime of ISIS TS2 targets. Two different and complementary methods were used to measure the residual strain in a tantalum-clad tungsten strip manufactured using the same HIP process as ISIS targets. The strip was produced with deliberately asymmetric cladding, causing it to deflect in proportion to the residual stress. FEA simulations were used to back calculate the stress from the measured deflection. The strip was then placed on the ISIS instrument ENGIN-X, which allowed detailed through-thickness strain profiles to be measured via neutron diffraction. The results of both methods confirm the presence of large residual strains, and agree reasonably well with FEA simulations of the cladding process. Modern spallation facilities require higher beam powers and reduced cladding thicknesses, so understanding these residual stresses will become increasingly important to ensure target integrity.

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