
*Sample preparation facilities to enable high quality
in situ ion irradiation mechanical testing experiments*

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ABSTRACT:

This project will establish a reliable and efficient sample preparation workflow for the production of the irradiation-thin samples required for *in situ* ion irradiation mechanical testing (I³MT) experiments, at the University of Wisconsin–Madison’s (UW-M) Ion Beam Laboratory (IBL). Best practices in micro wire electrical discharge machining (μ EDM) and precision micrometer-controlled mechanical polishing will be used to reduce specimen thicknesses to 10s of μ m, to allow for the transmission of 3 MeV H⁺ ions through samples, creating radiation damage without significant H implantation. Prior to irradiation, pristine surfaces will be prepared through electropolishing followed by *in situ* plasma cleaning, to remove any residual cold-work and hydrocarbon contamination, respectively. These techniques will elevate the IBL, as part of the Nuclear Science User Facilities (NSUF), to match sample preparation strategies at other leading accelerator facilities such as the Michigan Ion Beam Laboratory (MIBL) and Texas A&M Accelerator Laboratory. The development of this fabrication workflow will underpin the advances in ion irradiation that are required to accelerate the development and qualification of structural and cladding materials for light water reactor (LWR) and advanced reactor technologies.