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Recent Post-Irradiation Examination and Testing Results for Proton-Irradiated Ti-Base Alloys

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Three capsules containing Ti-base alloys were irradiated as part of the proton irradiation experiment organized by the RaDIATE Collaboration at the Brookhaven Linac Isotope Producer (BLIP). The downstream Ti-1 capsule was opened at PNNL in spring 2018, the upstream Ti capsule was opened at PNNL in fall 2018, and the downstream Ti-2 capsule will be shipped to PNNL from BNL in spring 2019. Samples of four different alloy grades (Grade 5, Grade 23, Grade 23-forged and Grade 9) from the DS Ti-1 capsule were subjected to tensile tests at room temperature and 200°C. There were notable differences in the effects of temperature and irradiation dose between the Ti-3Al-2.5V (Grade 9) alloys and the Ti-6Al-4V (Grades 5, 23 and 23-forged) alloys. The presentation will review the tensile data and will include scanning and transmission electron microscopy characterization (including electron backscatter diffraction analysis) of the unirradiated and irradiated (as available) microstructures. The presentation will also review the opening of the US Ti capsule that failed during irradiation. Sample recovery efforts will be highlighted along with efforts to characterize the proton beam location and dose profile using Gafchromic film dosimetry. Finally, the presentation will review plans for Ti-base alloy testing during 2019 including US Ti and DS Ti-2 tensile testing, microscopy, and nanohardness measurements.

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