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Dynamic shear localization of a titanium alloy under high-rate tension characterized by x-ray digital image correlation

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**Title:** Dynamic shear localization of a titanium alloy under high-rate tension characterized by x-ray digital image correlation

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**Abstract:** Dynamic and quasi-static tension experiments are conducted on Ti-6Al-4V alloys, with in situ, synchrotron-based, high-speed, x-ray phase contrast imaging implemented to characterize the dynamic deformation and fracture process of Ti alloys at the Advanced Photon Source. X-ray digital imaging correlation (XDIC) is applied for strain field mapping. The size distribution of x-ray speckles are quantified via a morphological analysis, with a mean of  $\sim 20$   $\mu\text{m}$ . Systematic error analyses of displacement and strain field measurements are firstly conducted for XDIC, and demonstrate that the displacement and strain errors can be controlled below 0.01 pixel and 0.1%, respectively. Mesoscale strain characteristics measured via XDIC are consistent with and reveal mechanisms for the bulk-scale stress-strain responses. Under dynamic tension, a sharp transition

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