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A study of photoemission using CW and pulsed UV light sources to probe surface slip band structure evolution of single crystal aluminium[1]
MINGDONG CAI, University of Houston, STEPHEN LANGFORD, J. THOMAS DICKINSON, Washington State University — We report measurements of photoelectron emission from high-purity single crystal aluminum during uniaxial tensile deformation. A 248 nm pulsed excimer laser was used as a light source and the generated photoemission data was compared with that using a filtered mercury lamp. Time-of-flight curves of photoelectrons generated by pulsed excimer laser irradiation were observed showing a two peaked structure. These two peaks correspond to photoelectrons of two energy levels. It was also found that real time total photoelectron charge increases linearly with strain; and the increment is heterogeneous. Photoemission using low-energy photons is sensitive to changes in surface morphology accompanying deformation, including slip line and band formation. The discontinuity in photoelectron intensity and the heterogeneous surface slip band structure prove the production of fresh surface area is not continuous, which is predicted by a recent dislocation dynamics theory based on percolation process. Except for differences in instrumentation and data analysis, the photoemission data from a filtered mercury lamp and from the excimer laser are comparable. Current studies extend the application of the excimer laser into surface dynamics analysis.

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