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The role of microstructure on elastic precursor decay JOHN JONSSON, DAVID CHAPMAN, DANIEL EAKINS, Department of Engineering Science, University of Oxford — The elastic precursor wave has long been a focus for the study of yielding during intense dynamic loading, as its evolution is directly linked to the time-dependent movement and generation of dislocations at the onset of plastic flow. Previous studies of precursor decay have mostly concentrated on strain-rate and temperature dependence of various metals such as aluminium, iron and copper, typically in the idealised annealed or single-crystal conditions. There has been comparatively limited exploration of the role of the initial microstructural state, specifically the initial defect density and material processing history. Here we present results from a series of PDV instrumented plate-impact experiments on aluminium and magnesium using a single-stage gas gun, in which a range of initial microstructural states have been examined. In aluminium, both pure and alloyed samples with varying degrees of heavy prior cold working (swaging) of up to three passes are studied. In magnesium, we examine both conventionally cast and high shear melt conditioned samples. We discuss the observed decay rates in light of dislocation measurements and the variations in material processing histories.

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