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Analytical Modeling of Elastic-Plastic Wave Behavior Near Grain Boundaries in Crystals ERIC LOOMIS, Los Alamos National Laboratory, DAMIAN SWIFT, Lawrence Livermore National Laboratory, PEDRO PERALTA, Arizona State University, S.R. GREENFIELD, S.N. LUO, Los Alamos National Laboratory — It is well known that changes in material properties across an interface will produce differences in the behavior of reflected and transmitted waves. This is seen frequently in planar and oblique impact experiments. In anisotropic elastic materials, wave behavior as a function of direction is usually studied with the aid of velocity (or slowness) surfaces. We have expanded this method to account for inelastic deformation due to crystal plasticity, which led to an implicit problem rooted in the form of the plastic strain rate tensor. To overcome this difficulty an algorithm was developed to search the parameter space defined by a wave normal vector, particle velocity vector, and a wave speed. A solution was said to exist when a set from this parameter space satisfied the governing vector equation. Using this technique we can predict the grain boundary scattering configuration for crystalline materials undergoing deformation by slip. Specifically, we have calculated the configuration of scattered elastic-plastic waves in anisotropic NiAl for an incident compressional wave propagating along a <111> direction and contacting a 45 degree inclined grain boundary and found that large amplitude transmitted waves exist owing to the fact that the wave surface geometry forces it to propagate near the zero Schmid factor direction <100>.

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