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Investigation of Linear Stability Theory for Wavy Interface in Magnetic Pulse Welding ALI NASSIRI, GREGORY CHINI, BRAD KINSEY, University of New Hampshire — Magnetic Pulse Welding (MPW) is a solid state, high strain-rate joining process in which a weld of dissimilar or similar materials can be created via high-speed oblique impact of two workpieces. MPW is a lap welding method: the two workpieces are placed in a roughly parallel configuration with a small gap between them to achieve high impact velocity and pressure. Intriguingly, experiments routinely show the emergence of a distinctive wavy pattern, with a well defined amplitude and wavelength of approximately 20 and 70 micrometers, respectively, at the interface between the two welded materials. The mechanism underlying this wavy pattern is still not well understand. Some researchers have proposed that the interfacial waves are formed in a process akin to Kelvin-Helmholtz instability, with relative shear movement of the flyer and base plates providing an energy source for the vortical pattern. Here, we employ a linear stability analysis to investigate whether the wavy pattern could be the signature of a shear-driven high strain-rate instability of a perfectly plastic solid material. Preliminary results confirm that an instability giving rise to a wavy interfacial pattern is possible.

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