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Gas Gun Studies of Interface Wear Effects TYLER JACKSON, GREG KENNEDY, NARESH THADHANI, Georgia Institute of Technology —
The characteristics of interface wear were studied by performing gas gun experiments at velocities up to 1km/s. The approach involved developing coefficients of constitutive strength models for Al 6061 and OFHC-Cu, then using those to design die geometry for interface wear gas gun experiments. Taylor rod-on-anvil impact experiments were performed to obtain coefficients of the Johnson-Cook constitutive strength model by correlating experimentally obtained deformed states of impacted samples with those predicted using ANSYS AUTODYN hydrocode. Simulations were used with validated strength models to design geometry involving acceleration of Al rods through a copper concentric cylindrical angular extrusion die. Experiments were conducted using 7.62mm and 80mm diameter gas guns. Differences in the microstructure of the interface layer and microhardness values illustrate that stress-strain conditions produced during acceleration of Al through the hollow concentric copper die, at velocities less than 800m/s, result in formation of a layer via solid state alloying due to severe plastic deformation, while higher velocities produce an interface layer consisting of melted and re-solidified aluminum.

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