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High Strain-Rate Response of High-Purity Aluminum at Temperatures Approaching Melt[1] STEPHEN GRUNSCHEL, RODNEY CLIFTON, TONG JIAO, Brown University — High-temperature, pressure-shear plate impact experiments were conducted to investigate the rate-controlling mechanisms of the plastic response of high-purity aluminum at high strain rates (10^6 s^{-1}) and at temperatures approaching melt. Similar experiments were conducted by Frutschy and Clifton (*JMPS* **46,** 1998, 1723-1743) on OFHC copper. In the current study, temperatures that are larger fractions of the melting temperature were accessible because of the lower melting point of aluminum. Since the melting temperature of aluminum is pressure dependent, and a typical pressure-shear plate impact experiment subjects the sample to large pressures (2 GPa – 7 GPa), a pressure-release type experiment was used to reduce the pressure in order to measure the shearing resistance at temperatures up to 95% of the current melting temperature. The measured shearing resistance was remarkably large (∼50 MPa at a shear strain of 2.5) for temperatures this near melt. Numerical simulations conducted using a version of the Nemat-Nasser/Isaacs constitutive equation (*Acta Materialia* **45**(3), 1997, 907-919), modified to model the mechanism of geometric softening, appears to capture adequately the hardening/softening behavior observed experimentally.

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