Abstract Submitted
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Formation of Plasma from Thick Metal Pulsed with Multi-Megagauss Magnetic Field[1] B.S. BAUER, K.C. YATES, S. FUELLING, V.V. IVANOV, I.R. LINDEMUTH, R.E. SIEMON, A.A. ANDERSON, T. HUTCHINSON, J. MEI, University of Nevada, Reno, T.J. AWE, Sandia National Laboratories, R.S. BAUER, Stanford University — Understanding the evolution of ohmically heated conductors is exceptionally important for basic physics and applications (e.g., fusion energy). The thermal ionization of the surface of metal rods with radii larger than the magnetic skin depth is being investigated with well-characterized experiments and detailed numerical modeling. Metal rods of initial diameter 0.50-2.00 mm are pulsed to 1.0 MA peak current in 100 ns. The rod material (Al-6061, Al-1100, Cu-101, Cu-145, Ni-200, or Ti-Grade-II) and surface finish (finely or coarsely machined, electropolished or not) are varied. Time-resolved imaging, radiometry, spectroscopy, and laser shadowgraphy track the evolution of the rod surface. Plasma forms when the surface magnetic field reaches a critical value (e.g., 2.2 MG for Al-6061). At the threshold, the optical emission from the surface is non-uniform, initially showing discrete bright points. Then plasma filaments form, mainly in the direction of the current, until the surface emission is quite uniform. Radiation-MHD simulations with the numerical code MHRDR can reproduce macroscopic features of the data on aluminum by using certain choices of models for resistivity, equation of state, other transport coefficients, and radiation opacities.

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