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Simulation of Electrothermal Instability Growth During Pulsed Power Driven Implosions of Metallic Liners Coated with Dielectric Coatings[1] MATTHEW CARRIER, BHUVANA SRINIVASAN, ROBERT MASTI, Virginia Tech, C. LELAND ELLISON, Lawrence Livermore National Lab — Pulsed power experiments drive megaampere (MA) currents through metallic rods in nanosecond timescales, resistively heating the outer layer into plasma. Preliminary studies indicate that microscale material inhomogeneities can cause uneven heating, which leads to current filamentation or striation if the rods' electrical resistivity is temperature dependent. This creates a feedback loop that results in electrothermal (ET) instabilities that seed magneto-Rayleigh-Taylor (MRT) instabilities. The Plasma Dynamics Computational Laboratory at Virginia Tech has run simulations using the Ares code developed by Lawrence Livermore National Laboratory to model 0.8 MA currents pulsed through 0.8mm diameter metallic rods, in support of an effort by University of Nevada Reno (UNR) collaborators on the MYKONOS-V driver at Sandia National Laboratories (SNL). The magnetohydrodynamics code uses the Los Alamos National Laboratory SESAME equation of state tables and the SNL Lee-More-Desjarlais conductivity tables to model material effects. To better understand ET mitigation techniques, the computational study also investigates rods coated with dielectric material of varying thicknesses and compares the surface expansion velocities to photonic doppler velocimetry (PDV) of the UNR-SNL experiment.

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