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Thermo-Mechanical Modeling of Foil-Supported Carbon Nanotube Array Interface Materials PARISA POUR SHAHID SAEED ABADI, BARATUNDE COLA, SAMUEL GRAHAM, Woodruff School of Mechanical Engineering, Georgia Institute of Technology — A thin metal foil with vertically aligned carbon nanotube (CNT) arrays synthesized on both sides is a new class of thermal interface materials that has demonstrated thermal resistances less than 0.1 cm^2 K/W under moderate pressures. Such interface materials are able to obtain such low resistances due to their unique combination of high thermal conductivity and high conformability to surface roughness. For such structures, the contact resistances between CNT arrays and the adjacent surfaces are the major constituents of total resistance. Here we integrate a recently developed contact mechanics model for CNT arrays with a finite element code that captures the nonlinear mechanical behavior of the interface material and the effects of interface topography on the thermal performance. The developed model elucidates the relative affects of metal foil as well as CNT array deformation on the compliance of the composite structure. The results support previous experimental observations that the combination of foil and CNT array deformation significantly enhances interfacial contact and thermal conductance.

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