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Reactive wetting and spreading in metal/metal systems Y. SUN, B.T. MURRAY, T.J. SINGLER, A. CHAUHAN, SUNY at Binghamton, L. YIN, Unovis, E. WEBB, Sandia National Lab — Wetting, phase change and reaction in high temperature systems, such as when a liquid metal drop spreads spontaneously on a metal substrate, are fundamental to many materials processing applications. Rapidly melted solid drops are typically used to study the wetting and spreading behavior of low melting point alloys on a solid metal as a model of soldering processes in microelectronics fabrication. Kinetics, e.g., contact line motion, dissolution and intermetallic compound formation, are frequently very fast, requiring high speed video imaging to resolve the temporal evolution of the drop spreading. Phase change at the liquid/solid interface leads to more complex spreading behavior (e.g., contact line morphology) that is not observed in inert spreading. In order to better understand the phenomena observed in the drop spreading experiments, multiscale models are employed. Molecular dynamics simulations on the nanometric scale exhibit many characteristics observed in millimetric scale laboratory experiments. Two types of continuum models are employed: a primarily diffusive transport model and a phase-field model coupled to hydrodynamic transport. Both models simulate the wetting and dissolution of the spreading drop at the scales of the experiments. The model results for the extent of spreading are compared to the experiments.

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