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Metal Island Coalescence Stress for Varying Surface Traction STEVEN SEEL, EDMUND WEBB III, JONATHAN ZIMMERMAN, Sandia National Laboratories — During Volmer-Weber thin film growth, discrete metal islands grow on a substrate. When the separation between their adjacent free surfaces becomes small enough, islands coalesce and trade surface energy for elastic strain energy. While it is understood that traction between island and substrate directly influences coalescence stress, questions remain. For instance, wafer curvature measurements during growth of low traction systems indicate zero stress in the growing film. This results from a lack of mechanical coupling between film and substrate so island stress cannot be accurately determined from experimental data. We examine, via atomistic simulations, coalescence between two metal islands as a function of island size and island-substrate traction. We reveal the stress state in the coalesced structure for low traction where entire islands are able to slide along the substrate. This is compared to higher traction where islands can only slide near the point of coalescence resulting in local tensile strain. We conclude by examining the dependence upon island size of the traction above which only local sliding is observed. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

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