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Evolution of the morphology and composition of metal germanosilicide thin films MATHIEU BOUVILLE, DONGZHI CHI, Institute of Materials Research and Engineering, Singapore, DAVID J. SROLOVITZ, Princeton University — Metal germanosilicide thin films, formed from the reaction of metals on silicon-germanium substrates, are attractive for use in advanced metal-oxide-semiconductor field-effect transistors (MOSFETs). However, metal germanosilicide films are less stable than silicides films at elevated temperatures, easily agglomerating into isolated islands following severe grain boundary grooving. The resultant germanosilicide islands are noticeably different from both silicides and germanides. Agglomerated germanosilicide films consist of small, regular islands with faceted interfaces, whereas agglomerated silicides form irregular islands and uniformly curved island/substrate interfaces. Experimental observations show that the germanium composition is inhomogeneous both in the film and in the substrate. We use phase-field simulations to study the interplay between morphology, composition inhomogeneities, and strain during grain boundary grooving and agglomeration of polycrystalline metal germanosilicide films on silicon-germanium alloy substrates. By simulating the evolution of germanosilicide films on compressive and relaxed substrates, we demonstrate the important role played by misfit stress on agglomeration morphologies.

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