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Far-from-equilibrium film growth on alloy surfaces: Ni and Al on NiAl(110) JIM EVANS, YONG HAN, BARIS UNAL, Iowa State University, DAPENG JING, PATRICIA THIEL, Iowa State University — We analyze the deposition of Ni and Al on NiAl(110) by STM and by KMC simulation of a multi-site lattice-gas model incorporating DFT energetics. The goal is to elucidate far-from-equilibrium growth of metal films on alloy surfaces, including self-growth. Deposition of Ni produces reversible formation of monolayer islands with some preference for diagonal steps at 300K and which are distorted-hexagons at 400K. Deposition of Al at 300K produces irreversible formation of irregular monolayer islands perhaps favoring [-110] steps. These features are recovered by the modeling, which captures distinct terrace diffusion pathways of Ni versus Al on NiAl(110), the details of island nucleation, and complex edge diffusion which controls growth shapes. Additional studies of sequential co-deposition reveal "history-dependent" structures far from perfect equilibrium alloy ordering. Depositing Al first then Ni creates monolayer islands with a core of Al surrounded by a ring of Ni. In contrast, depositing Ni first then Al creates monolayer Ni islands with significant second layer population by Al reflecting stronger binding of Al on top of the Ni islands.

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