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Complex electronic interference effects in Ag films on Ge(111)

YANG LIU, NATHAN SPEER, University of Illinois at Urbana-Champaign, SHU TANG, National Tsing Hua University, THOMAS MILLER, TAI CHIANG, University of Illinois at Urbana-Champaign — We have performed a 3-D mapping by angle-resolved photoemission of the electronic structure of atomically uniform Ag thin films grown on Ge(111). Electrons in the Ag film with energies within the absolute gap of Ge are fully confined, forming quantum well states, while electrons with energies outside this gap form quantum well resonances. In addition to these features, our results show complex interference patterns that can be attributed to umklapp processes at the interface. The lattice mismatch between Ag and Ge creates an incommensurate interface, which introduces multiple periodicities, resulting in a rich electronic structure. We have performed a detailed numerical analysis of the experimental results, and the interaction parameters, related to the interfacial potential modulation, are extracted.

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