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Single-layer Dual Germanene Phases on Ag(111) SHU-JUNG TANG, CHUNG-HUANG LIN, ANGUS HUANG, National Tsing Hua University, WOEI WU PAI, National Taiwan University, WEI-CHUANG CHEN, National Synchrotron Radiation Center, TAY- RONG CHANG, National Tsing Hua University, RYU YUKAWA, The University of Tokyo, HORNG-TAY CHENG, CHUNG-YU MOU, National Tsing Hua University, IWAO MATSUDA, The University of Tokyo, TAI-CHIANG CHANG, University of Illinois at Urbana-Champaign — Two distinct phase-separated single-layer honeycomb germanene lattices were identified for germanium growth on Ag(111). The geometric and electronic structures of these two phases, and their correlations, were characterized by STM, LEED, ARPES, and ab-initio calculations. We discovered that a stripe phase germanene, which is partially commensurate with Ag(111) and possesses significant tensile strain, exhibits the unambiguous atomic up-down buckling pattern of an ideal germanene lattice. It emerges from the de-alloying process of the known Ag2Ge surface alloy phase and covers the whole surface at 0.84 ML of Ge. Up to 1.08 ML, a new strain-relaxed germanene phase, which shows an abrupt decrease of Ge-Ge bond length to that of free-standing germanene and is fully incommensurate with Ag(111). This denser phase is quasi-freestanding-like because it preserves the electronic structure symmetrical at germanene$\bar{K}$point, where a dominant band observed at -3.5 eV, corresponding to Ge-Ge σ bonding. In contrast, the electronic structure of the stripe-phase germanene diminishes at the germanene $\bar{K}$point and a new band coupled strongly to the substrate emerges at the Ag(111)$\bar{M}$

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