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Si adatoms as catalyst for the growth of monolayer Al film on Si(111) JING TENG, LSU, LIXIN ZHANG, National Renewable Energy Laboratory, KEHUI WU, YING JIANG, JIANDONG GUO, QINLIN GUO, CAS, China, PHILIPP EBERT, Forschungszentrum Jülich GmbH, TOSHIO SAKURAI, Tohoku University, Japan, ENGE WANG, CAS, China — Recently, we reported the growth of atomically smooth Al(111) films on Si(111) with continuously controllable thickness down to the extreme level of 1 ML. Here, we study the underlying unexpected Si adatom-mediated clustering-melting mechanism by scanning tunneling microscopy and by the first-principles calculations. The Si adatoms in the initial Si(111) $\sqrt{3}\times\sqrt{3}$ -Al surface act as seeds to form $SiAl_2$ clusters. The clusters are then transformed into Al(111) 1×1 by incorporating further incoming Al atoms and spontaneously releasing the Si atoms, which then participate in the next cycle of the process. As a result, a two-dimensional growth of monolayer Al(111) is achieved.

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