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Observation of Dirac electrons in germanene on diboride thin films ANTOINE FLEURENCE, RAINER FRIEDLEIN, Japan Advanced Institute of Science and Technology, HIROYUKI YAMANE, Institute for Molecular Science, HOWON KIM, Institute for Solid State Physics, YUUTO AWATANI, Japan Advanced Institute of Science and Technology, SHINYA YOSHIMOTO, KOZO MUKAI, TAKANORI KOITAYA, YUKIO HASEGAWA, JUN YOSHINOBU, Institute for Solid State Physics, NOBUHIRO KOSUGI, Institute for Molecular Science , YUKIKO YAMADA-TAKAMURA, Japan Advanced Institute of Science and Technology — Germanene is a single atom thick honeycomb lattice of Ge atoms. Just like silicene, free-standing germanene is predicted to feature π bands forming graphene-like Dirac cones [1]. Epitaxial germanene was already claimed to form on number of substrates [2-4], but no evidence for the existence of a π electronic system has been reported yet. In the present work, we demonstrate experimentally that Ge atoms segregated on the (0001) surface of zirconium diboride (ZrB_2) thin films grown on Ge(111) form a germanene layer. ZrB_2(0001) with germanene is ($3\sqrt{}3X3\sqrt{}3$)-reconstructed at low-temperature and ($\sqrt{}3X\sqrt{}3$)-reconstructed at room temperature. The ($3\sqrt{}3X3\sqrt{}3$) reconstruction originates from the matching of this unit cell with the (4X4) unit cell of a Ge honeycomb lattice. Evidence for its germanene nature stems from the observation of the Dirac cone-like dispersion at the K point of its Brillouin zone. [1] S. Cahangirov et al., Phys Rev. Lett. 102, 236804 (2009). [2] L. Li et al., Adv. Mater. 26, 4820 (2014). [3] M. E. Dávila et al., New J. Phys. 16, 095002 (2014).
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