Molecular beam epitaxial growth of a three-dimensional topological Dirac semimetal Na$_3$Bi

SUNG-KWAN MO, YI ZHANG, YEONGKWAN KIM, ZAHID HUSSAIN, Advanced Light Source, Lawrence Berkeley National Lab, ZHONGKAI LIU, ZHI-XUN SHEN, SIMES, Stanford University, BO ZHOU, YULIN CHEN, University of Oxford — Three-dimensional topological Dirac semimetals (3D TDS) represent an unusual state of quantum matter that can be viewed as a bulk analogue of graphene. The realization of 3D TDS is recently verified experimentally in Na$_3$Bi and Cd$_3$As$_2$. We report a molecular beam epitaxial growth of Na$_3$Bi on bilayer graphene and Si(111). Our in-situ angle-resolved photoemission data reveal the 3-dimensional Dirac-cone band structure in such thin films even down to 12 unit cell thickness. Our approach of growing Na$_3$Bi thin film provides a potential route for fabricating it into practical devices while preserving unique properties of 3D TDS. *Yi Zhang et al. Appl. Phys. Lett. 105, 031901 (2014).