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Electronic band structure of surface-doped black phosphorus¹

JIMIN KIM, Pohang University of Science and Technology, SAE HEE RYU, YEONGSUP SOHN, KEUN SU KIM, Pohang University of Science and Technology, Institute for Basic Science — There are rapidly growing interests in the study of few-layer black phosphorus owing to its promising device characteristics that may impact our future electronics technology. The low-energy band structure of black phosphorus has been widely predicted to be controllable by external perturbations, such as strain and doping. In this work, we attempt to control the electronic band structure of black phosphorus by in-situ surface deposition of alkali-metal atoms. We found that surface doping induces steep band bending towards the bulk, leading to the emergence of new 2D electronic states that are confined within only few phosphorene layers of black phosphorus. Using angle-resolved photoemission spectroscopy, we directly measured the electronic band structure and its evolution as a function of dopant density.

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