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Thermoelectric imaging of grain boundaries in monolayer MoS2 on the atomic scale SANGHEE CHO, HO-KI LYEO, Korea Research Institute of Standards and Science, LAIN-JONG LI, King Abdullah University of Science and Technology, YONG-HYUN KIM, Korea Advanced Institute of Science and Technology, CHENDONG ZHANG, CHIH-KANG SHIH, The University of Texas at Austin — We used scanning thermoelectric microscopy to investigate structural defects such as point defects, edge and grain boundary in ultrathin films of MoS_2 grown on graphite. Such structural changes cause the variation in local electronic states, which can be detected by thermoelectric measurement that is differentially sensitive to the Fermi electronic states. Measured thermoelectric power increased with increasing thickness of MoS_2 from monolayer to multilayer, which makes a different contrast in the images of thermoelectric measurements. The changes in thermoelectric power with varying thickness can be accounted for by the changes in energy band structure. This imaging method enabled us to identify the metallic edge states, which is similar to prior measurements from tunneling spectroscopy, at the boundaries between MoS_2 and graphite. Moreover, grain boundaries appear with distinct contrast in thermoelectric measurements from micrometer to atomic scale, whereas the boundaries were subtle in topographic measurements. Simultaneous measurements of topographic and thermoelectric signal revealed the structural and electronic properties of grain boundaries on the atomic scale.

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