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**Free-electron Creation at the 60 Twin Boundary in $Bi_2Te_3$**
SEUNG-HYUB BAEK, KWANG-CHON KIM, JIN-SANG KIM, Center for Electronic Materials, Korea Institute of Science and Technology, Seoul 136-791, Republic of Korea — Interfaces, such as grain boundaries in a solid material, are excellent regions to explore novel properties that emerge as the result of local symmetry-breaking. For instance, at the interface of a layered-chalcogenide material, the potential reconfiguration of the atoms at the boundaries can lead to a significant modification of the electronic properties because of their complex atomic bonding structure. Here, we report the experimental observation of an electron source at 60 twin boundaries in $Bi_2Te_3$, a representative layered-chalcogenide material. First-principles calculations reveal that the modification of the interatomic distance at the 60 twin boundary to accommodate structural misfits can alter the electronic structure of $Bi_2Te_3$. The change in the electronic structure generates occupied states within the original bandgap in a favourable condition to create carriers and enlarges the density-of-states near the conduction band minimum. The present work provides insight into the various transport behaviours of thermoelectrics and topological insulators.

Seung-Hyub Baek
KIST

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