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Influence of the cubic-tetragonal structural transition on the k-resolved band structure of $CH_3NH_3PbI_3$ hybrid organic-inorganic perovskite MIN-I LEE, A. BARRAGAN, Univ. Paris Sud, CNRS, M. NAIR, UR1 CNRS/Synchrotron SOLEIL, V. JACQUES, D. LE BOLLOCH, Univ. Paris Sud, CNRS, P. FERTEY, Synchrotron SOLEIL, K. JEMLI, F. LEDEE, G. TRIPPE-ALLARD, E. DELEPORTE, ENS Cachan, CNRS, Univ. Paris-Sud, A. TALEB-IBRAHIMI, UR1 CNRS/Synchrotron SOLEIL, A. TEJEDA, Univ. Paris Sud, CNRS, UNIV. PARIS SUD, CNRS COLLABORATION, SYNCHROTRON SOLEIL COLLABORATION, ENS CACHAN, CNRS, UNIV. PARIS-SUD COLLABORATION — Hybrid organic-inorganic halide perovskites have become a promising material for photovoltaics due to their high performance of energy conversion efficiencies. The most outstanding performance (22%) is contributed by methylammonium lead halide perovskite ($CH_3NH_3PbI_3$, MAPI), which is also compatible with a low-temperature and low-cost fabrication in solution. A requirement to further improve the performances is the better understanding of the electronic band structure, which has remained experimentally elusive until now. Also, the impact of the structural phase transitions on the band structure in the operation temperature range of solar cells must be elucidated. Herein, we present the first experimental determination of the band structure of MAPI with k resolution. Our results show that the electronic periodicity in the tetragonal phase of MAPI (below 50°C) corresponds to the high-temperature cubic phase. This will lead to the insensitivity of solar cells in the usual range of operating temperatures despite the cubic-tetragonal structural transition.

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