

The Optical Band Gap of Perovskite Materials for Solar Cells

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Perovskite thin films $CH_3NH_3PbCl_{3-x}Cl_x$ in this project are deposited by two-step deposition method to study the effect of chloride on the optical band gap. In this experiment, the band gap is insignificantly increased from 1.60 ± 0.01 eV with no Cl-doping to 1.62 ± 0.01 eV with 16% Cl-doping because some chloride ions cannot replace the iodide positions in $CH_3NH_3PbI_3$ and form $CH_3NH_3PbCl_3$ instead. Though the crystal structure of $CH_3NH_3PbI_3$ is cubic, with heavily Cl-doping, the crystal structure of $CH_3NH_3PbCl_{3-x}Cl_x$ becomes tetragonal and longer annealing time results in the leaving of Chloride in $CH_3NH_3PbCl_{3-x}Cl_x$. The presence of residual PbI_2 also affects the photon absorption of perovskite.

Authors: PHIROMRUK, Passakorn; Prof. CHATRAPHORN, Sojiphong (Department of Physics, Faculty of Science, Chulalongkorn University)

Presenter: PHIROMRUK, Passakorn

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