Intragrain charge transport in kesterite thin films—Limits arising from carrier localization

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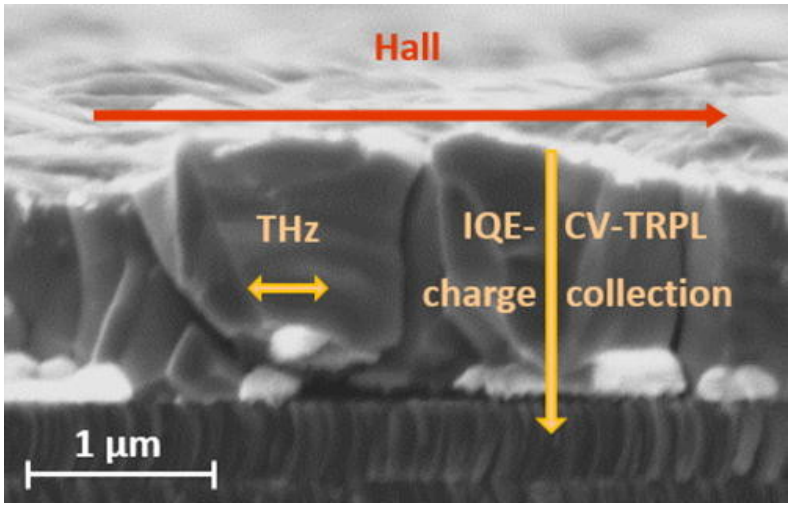
Short Abstract

Kesterite $Cu_2ZnSn(S,Se)_4$ materials have been intensely investigated in recent years as thin solar cell absorber materials. So far, the open-circuit voltage deficit has been identified as the main bottle neck but charge carrier dynamics are currently not well understood. The mobility of charge carriers is a key property of semiconductor materials, in particular for their application in various functional devices, such as solar cells. In this work, we examine the properties of the charge carrier transport in kesterite-type $Cu_2ZnSn(S,Se)_4$ thin films by contactless time-resolved terahertz spectroscopy (TRTS), which probes the charge carrier transport on the nm-scale.



Above. SEM picture of the NREL kesterite absorber on molybdenum with illustration of the different spatial sensitivities of TRTS, Hall, and IQE-CV-TRPL as charge carrier mobility measurements.