Abstract Submitted
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Tuning Fermi Level Beyond the Intrinsic Equilibrium Doping Limit through Quenching: the Case in CdTe[1] JI-HUI YANG, JI-SANG PARK, JOONGOO KANG, WYATT METZGER, TERESA BARNES, SU-HUAI WEI, National Renewable Energy Lab — The ability to tune the Fermi levels is of great importance for many electronic device applications. However, the Fermi level is often limited to a certain range in the band gap due to the existence of certain intrinsic compensating defects. Here, we demonstrate that quenching can be used as an effective way to overcome this limit and tune the Fermi levels in a much wider range. Taking a photovoltaic material, CdTe, as a prototype example, we analyzed the physical origin behind the Fermi level pinning and explain why growing the sample at high temperature and then rapidly quenching it to room temperature can overcome the self-compensation limit. We show that for CdTe, quenching can enlarge the Fermi level range from only about 0.6 eV to 1.1 eV, which has a great potential in improving CdTe solar cell performance. Our proposed strategy of tuning Fermi level positions beyond intrinsic equilibrium doping limit is general and can be applied to other semiconductor systems.

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