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Surface passivation studies of CdTe single crystals and polycrystalline films MATTHEW REESE, CRAIG PERKINS, JOSEPH LUTHER, TERESA BARNES, WYATT METZGER, NREL — Cadmium telluride-based photovoltaics have seen an impressive level of commercial growth due to their low manufacturing cost in spite of their low voltages. Typically, open circuit voltages peak at approximately 850 mV for this 1.5 eV bandgap material system. A large amount still needs to be understood about the various bulk and surface recombination mechanisms before these energetic losses can be significantly reduced. This work focuses on characterizing and understanding surface effects in both single crystals and polycrystalline films with lifetimes as measured by time-resolved photoluminescence (TRPL) and x-ray photoemission spectroscopy (XPS). Typically, tau_1 lifetimes of untreated and undoped CdTe material are 100 ps or less. These short lifetimes indicate very high surface recombination velocities exceeding 100,000 cm/s. We will share results on various wet and dry surface treatments that can improve this undoped material's lifetime, some by an order of magnitude, as well as give some preliminary indications as to the mechanism of their surface passivation.

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