Identifying the Electronic Properties Relevant to Improving the Performance of High Band-Gap Copper Based I-III-Vi2 Chalcopyrite Thin Film Photovoltaic Devices: Final Subcontract Report

By National Renewable Energy Laboratory (NREL)

Bibliogov, United States, 2012. Paperback. Book Condition: New. 246 x 189 mm. Language: English . Brand New Book ***** Print on Demand *****.This report summarizes the development and evaluation of higher-bandgap absorbers in the CIS alloy system. The major effort focused on exploring suitable absorbers with significant sulfur alloying in collaboration with Shafarman s group at the Institute of Energy Conversion. Three series of samples were examined; first, a series of quaternary CuIn(SeS)2-based devices without Ga; second, a series of devices with pentenary Cu(InGa)(SeS)2 absorbers in which the Se-to-S and In-to-Ga ratios were chosen to keep the bandgap nearly constant, near 1.52 eV. Third, based on the most-promising samples in those two series, we examined a series of devices with pentenary Cu(InGa)(SeS)2 absorbers with roughly 25 at. S/(Se+S) ratios and varying Ga fractions. We also characterized electronic properties of several wide-bandgap CuGaSe2 devices from both IEC and NREL. The electronic properties of these absorbers were examined using admittance spectroscopy, drive-level capacitance profiling, transient photocapacitance, and transient photocurrent optical spectroscopies. The sample devices whose absorbers had Ga fraction below 40 at. and S fractions above 20 at. but below 40 exhibited the best electronic properties and device performance.

Reviews

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