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Charge Transport in Two-Dimensional Hybrid Halide Perovskites
NAVEEN VENKATESAN, JOHN LABRAM, CHRISTOPHER TAKACS, HAYDEN EVANS, ERIN PERRY, FRED WUDL, MICHAEL CHABINYC, Univ of California - Santa Barbara — Hybrid-halide perovskite materials have garnered attention because they are earth-abundant, solution processable materials for photovoltaic cells. In this study, two methods were used to create two-dimensional, layered perovskites: replacement of halide ions by the pseudohalide thiocyanate (SCN^-), and the introduction of a large cationic spacer to form layered crystals with Ruddlesden-Popper structures. Films with large, well-oriented grains of $(MA)_2Pb(SCN)_2I_2$ formed during growth by spin coating. Using time-resolved microwave conductivity (TRMC) experiments, the carrier mobility in-plane was found to be comparable to that of methylammonium lead iodide ($MAPbI_3$), with carrier lifetimes on the order of 100 ns. Results as a function of dimensionality in R-P series will be presented. This charge transport data, along with increased stability that has been recently found in lower-dimensional perovskite systems, leads us to conclude that a three-dimensional structure is not a prerequisite for long carrier lifetime and carrier mobility.

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