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HYBRID PEROVSKITE SOLAR CELLS

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Lead-free organic-inorganic tin halide perovskites were prepared and investigated by a rapid screening technique utilizing a modified scanning electrochemical microscope (SECM). We studied liquid junction photoelectrochemical (PEC) cells based on p-type methylammonium tin halide ($MASnI_{3-x}Br_x$) perovskites employing the benzoquinone (BQ) redox couple, $BQ/BQ^{\bullet-}$, in dichloromethane (CH_2Cl_2). We found that the optimized Sn-based mixed halide perovskite, $MASnI_{0.5}Br_{2.5}$, exhibits enhanced performance and stability in liquid-junction PEC cells, with a power conversion efficiency of 1.51% (an increase of 20.8%) and a photovoltaic lifetime of 175 min (an increase of 75.0%), in comparison to MASnI3 perovskites.

Recent Publications

1. **H-Y Hsu, L Ji, H S Ahn, J Zhao, E T Yu and A J Bard (2015) A liquid junction photoelectrochemical solar cells based on p-Type $MeNH_3PbI_3$ perovskite with 1.05 V open-circuit photo voltage. Journal of the American Chemical Society 137(46):14758–14764.**
2. **H-Y Hsu, L Ji, M Du, J Zhao, E T Yu and A J Bard (2016) Optimization of lead-free organic–inorganic tin (II) halide perovskite semiconductors by scanning electrochemical microscopy. Electrochimica Acta 220:205–210.**
3. **H H-Y Hsu, L Ji, M Du, J Zhao, E T Yu and A J Bard (2016) Optimization of $PbI_2/MeNH_3PbI_3$ perovskite composites by scanning electro- chemical microscopy. Journal of Physical Chemistry C 120:19890–19895.**
4. **H-Y Hsu, J H Vella, J D Myers, J Xue and K S Schanze (2014) Triplet exciton diffusion in platinum polyyne films. Journal of Physical Chemistry C 118:4282–24289.**

Biography

Sam H Y Hsu has obtained his PhD degree under supervision of Professor Kirk S Schanze at University of Florida. After that, he received the two-year Postdoctoral and Research Associate's appointments respectively with Professor Allen J Bard and Professor Edward T Yu in Center for Electrochemistry and Department of Electrical and Computer Engineering at University of Texas at Austin. His research interests involve the material design, synthesis, processing, imaging, spectroscopy and solar energy application, aiming to explore fundamental properties and interactions of hybrid perovskite semiconductors and functional metallopolymer materials for developing efficient solar energy conversion processes. He has keen interests in photoinduced charge transfer processes, interfacial electron transfer, electrochemical hydrogen generation, and photoredox reactions for photovoltaics and solar fuel production. The investigations between material phenomena rely heavily on concepts and techniques of material and physical engineering, consisting of photophysics, electrochemistry, photo electrochemistry, scanning electrochemical microscopy and time-resolved photoluminescence spectra.

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