Hybrid Inorganic/Organic Systems for Opto-Electronics

Collaborative Research Centre 951

# Colloquium Announcement

**of the Collaborative Research Centre 951**
**"Hybrid Inorganic/Organic Systems for Opto-Electronics"**


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# Optoelectronic Perovskite Materials – Opportunities and Challenges for a Sustainable Energy Future

Time: Thursday, April 05, 2018, 3 pm c.t.

Place: IRIS Adlershof, Zum großen Windkanal 6, Room 007.


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# Optoelectronic Perovskite Materials – Opportunities and Challenges for a Sustainable Energy Future

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Perovskite solar cells (PSCs) have created much excitement in the past years and attract spotlight attention. This talk will provide an overview on the reasons for this development highlighting the historic development as well as the specific material properties that make perovskites so attractive for the research community.

The current challenges are exemplified using a high-performance model systems for PSCs (multication Rb, Cs, methylammonium (MA), formamidinium (FA) perovskites).(1,2) The triple cation (Cs, MA, FA) achieves power conversion efficiencies (PCEs) close to 21% due to suppressed phase impurities. This results in more robust materials enabling breakthrough reproducibility.
Through multication engineering, the seemingly too small Rb can be integrated (unsuited as a single-cation perovskite).(2) This results in a stabilized efficiency of 21.6%with one of the smallest differences between band gap and voltage ever measured for any PV material. Polymer-coated cells maintained 95% of their initial performance at elevated temperature for 500 hours under working conditions, a crucial step towards industrialisation of PSCs.

To explore the theme of multicomponent perovskites further, molecular cations were revaluated using a globularity factor. With this, we calculated that ethylammonium (EA) has been misclassified as too large. Using the multication strategy, we studied an EA-containing compound that yielded an open-circuit voltage of 1.59 V, one of the highest to date. Moreover, using EA, we demonstrate a continuous fine-tuning for perovskites in the "green gap" which is highly relevant for lasers and display technology. (3)

(1) Saliba et al. Cesium-containing triple cation perovskite solar cells: improved stability, reproducibility and high efficiency. Energy & Environmental Science (2016)
(2) Saliba et al. Incorporation of rubidium cations into perovskite solar cells improves photovoltaic performance. Science (2016)
(3) Gholipour, Saliba et al. Globularity-Selected Large Molecules for a New Generation of Multication Perovskites. Advanced Materials (2017)