Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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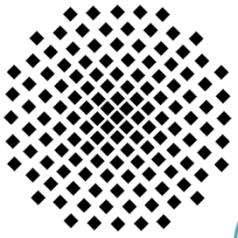

Dienstag, 21. Juni 2022	16:15 Uhr	V57.01

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The Versatility of Perovskite Materials for Optoelectronics

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Abstract

Perovskite solar cells (PSCs) have created much excitement in the past years and attract spotlight attention. This talk will provide an overview of 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 system for PSCs (multication Rb, Cs, methylammonium (MA), formamidinium (FA) perovskites). The triple cation (Cs, MA, FA) achieves high performances due to suppressed phase impurities. This results in more robust materials enabling breakthrough reproducibility.
Through multication engineering, usually not-considered alakali metals, such as Rb, can be studied resulting in one of the highest voltages compared to the bandgap. 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 re-evaluated 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 a high open-circuit voltage of 1.59 V. Moreover, using EA, we demonstrate a continuous fine-tuning for perovskites in the "green gap" which is relevant for lasers and display technology.
The last part elaborates on a roadmap on how to extend the multication to multicomponent engineering providing a series of new compounds that are highly relevant candidates for the coming years, also in areas beyond photovoltaics, for example for medical scintillation detectors.