

INM-KOLLOQUIUM

“HYBRID PEROVSKITES – ‘NOVEL’ PERSPECTIVES FOR OPTOELECTRONIC APPLICATIONS”

Prof. Dr. Thomas Riedl

Chair of Electronic Devices, School of Electrical Engineering
University of Wuppertal

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INM, Leibniz-Saal, Campus D2 5
Host: Prof. Dr. Tobias Kraus

Organo-metal halide perovskites have overwhelmed the area of thin film photovoltaics with efficiencies skyrocketing to levels of >20%.^[1] while concerns about stability are still intimately linked to the field.^[2] I will discuss our recent work to improve the stability of perovskite based solar cells by the introduction of impermeable charge transport layers, e.g. ALD-grown SnO_x.^[3] Based on this concept we also realized highly efficient self-encapsulating semi-transparent perovskite cells^[4] and In-free devices, with semitransparent electrodes based on ultra-thin Ag layers, which are chemically protected by the SnO_x.^[5]

Perovskites also state an intriguing platform for applications beyond solar cells. As of yet, their tremendous potential for photonic applications has not been unlocked because of a lack of suitable patterning techniques to create resonator structures, waveguides etc. directly into these perovskites. Crystal binding in these perovskites includes significant contributions of van der Waals interactions among the halide atoms and hydrogen bonding.^[6] The formation enthalpy per unit cell is only about 0.1eV in MAPbI₃.^[7] We took advantage of the “soft-matter properties” of organo-metal halide perovskites and demonstrated that photonic nano-structures can be prepared by direct thermal nano-imprint lithography in MAPbI₃ and MAPbBr₃ at low temperatures (<150°C). The resulting periodic patterns provided distributed feedback resonators, which afforded lasing in MAPbI₃ with ultra-low threshold levels on the order of 1 μJ/cm².^[8] I will discuss the applicability of thermal imprinting for perovskite solar cells and LEDs.

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- [7] A. Buin, P. Pietsch, J. Xu, O. Voznyy, A. H. Ip, R. Comin, E. H. Sargent, *Nano Lett* 2014, 14, 6281.
- [8] N. Pourdavoud, S. Wang, A. Mayer, T. Hu, Y. Chen, A. Marianovich, W. Kowalsky, R. Heiderhoff, H.-C. Scheer, T. Riedl, *Adv Mater* 2017, 29, 1605003.

Wir laden 15 Minuten vor Beginn zu einem Get-together mit dem Referenten ein.

KONTAKT

INM – Leibniz-Institut
für Neue Materialien gGmbH
Campus D2 2
66123 Saarbrücken
www.leibniz-inm.de

Christine Hartmann
Event Manager
christine.hartmann@leibniz-
inm.de
Tel: 0681-9300-244