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Department of Electronic Engineering

SEMINAR

Real-time Observation of Ion Migration in Inorganic–Organic Metal Halide Perovskite
and Its Influence on Device Stability

By

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Time: 4:00 p.m.

Venue: Room 222 Ho Sin Hang Engineering Building

Abstract:

Organic–inorganic metal halide perovskites (e.g., $\text{CH}_3\text{NH}_3\text{PbI}_3$) emerge as a promising optoelectronic material. However, the Shockley–Queisser limit for the power conversion efficiency (PCE) of perovskite-based photovoltaic devices is still not reached. Nonradiative recombination pathways may play a significant role and appear as photoluminescence (PL) inactive (or dark) areas on perovskite films. In addition, device stability is still the main problem to hinder its large-scale application. Recently, more and more evidences indicate the influence of ion migration on PL intensity, device performance and stability. In this work, we study the light/electric field induced behavior in $\text{CH}_3\text{NH}_3\text{PbI}_3$ films *in-situ*, by employing wide-field photoluminescence (PL) microscopy to obtain both the spatially- and temporally-resolved PL images simultaneously. The formation of PL inactive domains is attributed to the migration and accumulation of iodide ions under external fields. Hence, we are able to quantitatively characterize the kinetic processes and determine the drift velocities of these ions.

References:

- 1 Cheng Li, et al., Nat. Commun. 9, 5113 (2018)
- 2 Cheng Li, et al., Small. 13, 1701711 (2017)
- 3 Cheng Li, et al., Adv. Mater. 28, 2446 (2016)
- 4 Fabian. Panzer, Cheng. Li, et al., Adv. Energy Mater. 7, 1700286 (2017)

Biography:

Cheng was born and raised in Nanjing, China. He received his Bachelor and Master degree from Physics department at Nanjing University and his Ph.D degree from Cavendish Laboratory, University of Cambridge. Upon graduation, he spent four years at Department of Chemistry, University of Bayreuth, Germany as a postdoc researcher. He received the Marie Skłodowska-Curie Actions Seal of Excellence in 2017 and NSFC-DFG Joint Sino-German Research Projects grant in 2018.

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