SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Microelectronic Technologies and Devices

Host: Professor Armin Aberle (Main Supervisor) (Host)
Assistant Professor Hou Yi (Co-supervisor)

TOPIC	:	**Efficient All-Perovskite Tandem Solar Cells with V_{oc} Loss Minimization in Wide-Bandgap Subcells**
SPEAKER	:	**Ms. Wei Zhouyin** **Graduate Student, ECE Dept, NUS**
DATE	:	**Monday, 7 August 2023**
TIME	:	**4.00PM to 5.00PM**
VENUE	:	**Block E3A, E3A-04-25/26** **Level 4 Conference Room A/B** **College of Design and Engineering, NUS**

ABSTRACT

All-perovskite (all-PVSK) tandem solar cells, capable of exceeding the Shockley-Queisser single-junction solar cell efficiency limit, consist of a 1.7-1.9 eV wide-bandgap (WBG) top subcell and a 1.2-1.3 eV narrow-bandgap (NBG) bottom subcell. With a current world record efficiency of 29.1%, all-PVSK tandem solar cells outpace their best single-junction counterparts by 3% absolute. Nevertheless, a significant challenge in enhancing the efficiency of these tandem solar cells is the substantial open-circuit voltage (V_{oc}) loss in the wide-bandgap subcell. To mitigate this issue, we employed a novel self-assembled monolayer, DCB-Br-2, as a hole transport layer (HTL) in wide-bandgap perovskite solar cells. This approach reduces interfacial non-radiative recombination and notably diminishes the V_{oc} loss. The wide-bandgap perovskite solar cell (1.79 eV) built with DCB-Br-2 exhibits a high V_{oc} of 1.35 V, a power conversion efficiency (PCE) of 20.6%, a fill factor (FF) of 84.1%, and a short-circuit current density (J_{sc}) of 18.1 mA/cm^2. Importantly, the attained V_{oc} surpasses 90% of the Shockley-Queisser limit. When integrated with a 1.23-eV NBG subcell, the tandem configuration has a PCE of 26.75%. This study introduces a novel self-assembled monolayer that remarkably minimizes V_{oc} loss, thereby enabling the development of high-performance perovskite single-junction and tandem cells.

BIOGRAPHY

WEI Zhouyin received her Bachelor's degree from Chongqing University, China, in 2021. She is currently a Ph.D. student at ECE and the Solar Energy Research Institute of Singapore (SERIS) at NUS. Her supervisors are Prof. Armin ABERLE and A/Prof. Hou Yi. Her research interests include rigid & flexible all-perovskite tandem solar cells.