

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 3033-4063 CODEN ESEOU 2(2) 259–492 (2026)



Cover
See Filip Podjaski *et al.*, pp. 338–350. Image reproduced by permission of NPL Management from *EES Sol.*, 2026, 2, 338.



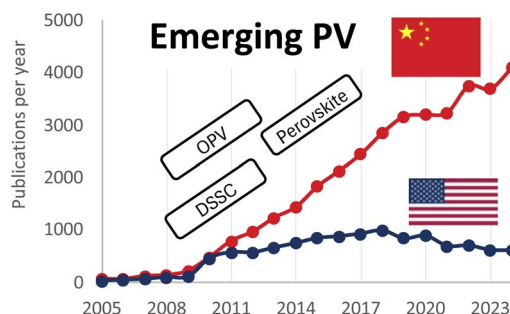
Inside cover
See Guillaume Wantz *et al.*, pp. 268–272. Image reproduced by permission of Pierre Berthaud from *EES Sol.*, 2026, 2, 268.

OPINION

268

Shifting scientific power in solar research: the spectacular rise of China in emerging photovoltaics

Pierre Berthaud, Marina Flamaud, Laëticia Guilhot, André Meunié and Guillaume Wantz*

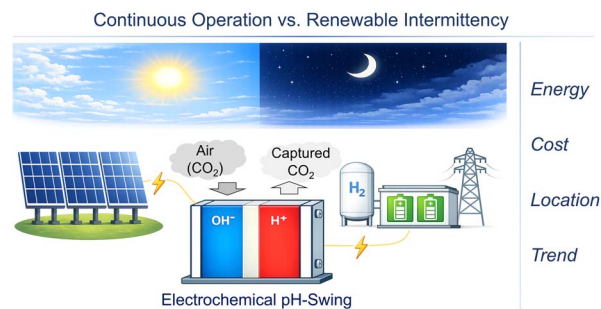


ANALYSIS

273

Electrochemical direct air capture with intermittent renewable energy: techno-economic insights from solar-driven electro dialysis systems

Guokun Liu, Yukun Zhang, Meng Lin* and Aidong Yang*



**GOLD
OPEN
ACCESS**

EES Batteries

**Exceptional research on
batteries and energy storage**

Part of the EES family

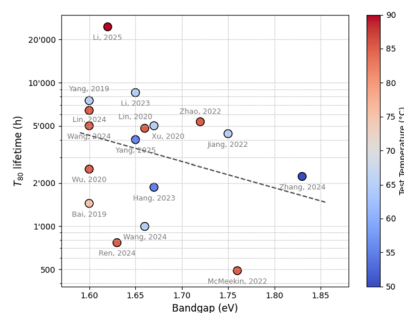
**Join
in** | Publish with us
rsc.li/EESBatteries

REVIEW

293

Unraveling bulk degradation mechanisms of wide-bandgap perovskite absorbers for tandem applications

Chiara Ongaro,* Mostafa Othman, Christophe Ballif, Christian M. Wolff and Aïcha Hessler-Wyser

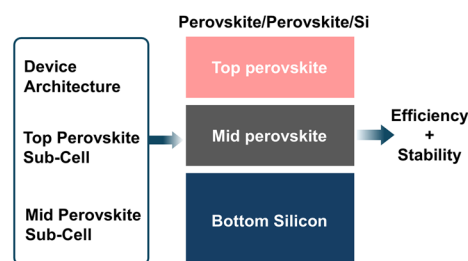


PERSPECTIVE

315

Perovskite/perovskite/silicon triple-junction solar cells: progress, challenges, and perspectives

Fuzong Xu,* Anand S. Subbiah, Ahmed Ali Said, Thomas Allen and Stefaan De Wolf*

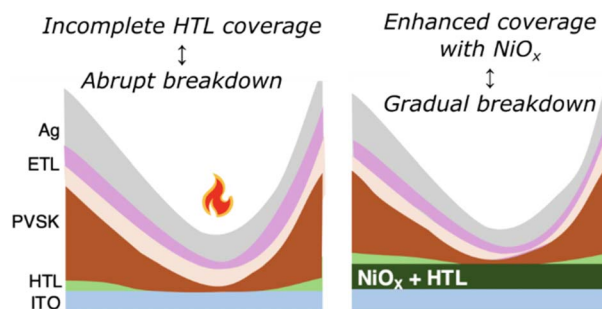


COMMUNICATIONS

323

Nickel-oxide hole-transport layers prevent abrupt reverse-bias breakdown and permanent shorting of perovskite solar cells caused by pinhole defects

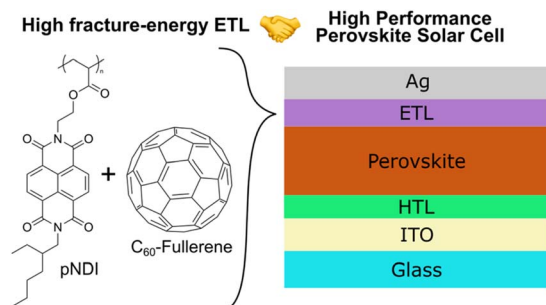
Daniel A. Morales, Jr, Collin Sindt, Kell Fremouw, Kaitian Mao, Matteo Poma, Thomas Stewart, Ryan A. DeCrescent and Michael D. McGehee*



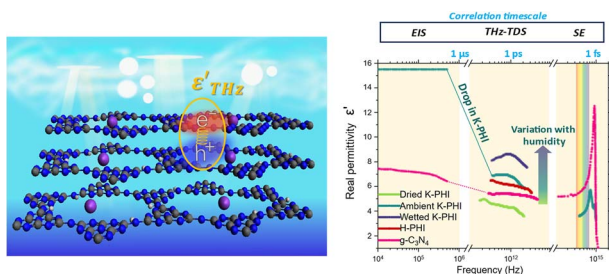
330

Incorporating a naphthalene diimide polymer into a fullerene electron-transport layer to improve the fracture energy of perovskite solar cells

Matteo R. S. Poma, Yadong Zhang, Muzhi(Charles) Li, Kaitian Mao, Ryan A. DeCrescent, Stephen Barlow, Nicholas Rolston, Seth R. Marder* and Michael D. McGehee*



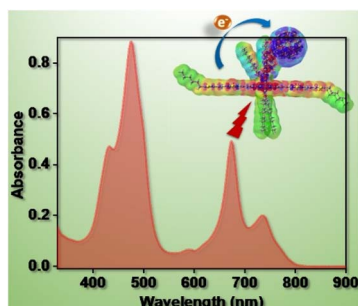
338



Sub-picosecond permittivity of carbon nitrides probed with terahertz spectroscopy: revealing high dielectric response and conductivity

Reehab Jahangir, Filip Podjaski,* Paransa Alimard, Sam A. J. Hillman, Stuart Davidson, Stefan Stoica, Andreas Kafizas, Mira Naftaly and James R. Durrant

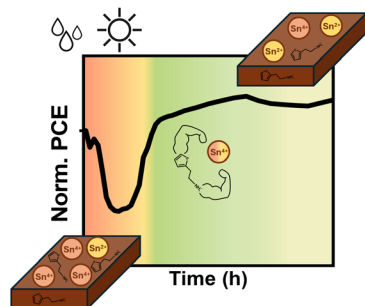
351



Porphyrin–thieno[3,2-*b*]thiophene hole-transport materials enabling the production of long-lived radical ion pairs and high-performance perovskite solar cells

Ram R. Kaswan, Bommaramoni Yadagiri, Jairam Tagare, Vinay Kumar, Manne Naga Rajesh, Paul A. Karr, L. Giribabu,* Surya Prakash Singh* and Francis D'Souza*

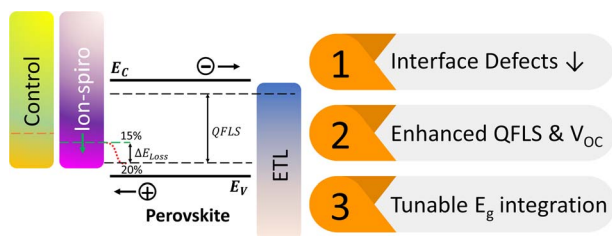
360



Ambient *operando* self-healing in tin perovskite solar cells

Miriam Minguez-Avellan, Omar E. Solis, Noemi Farinós-Navajas, Pablo F. Betancur, Jorge Pascual, Teresa S. Ripolles,* Rafael Abargues* and Pablo P. Boix*

369



Bandgap-tunable transparent perovskite solar cells for 4T Si/perovskite tandem photovoltaics with PCE > 30% via rational interface management

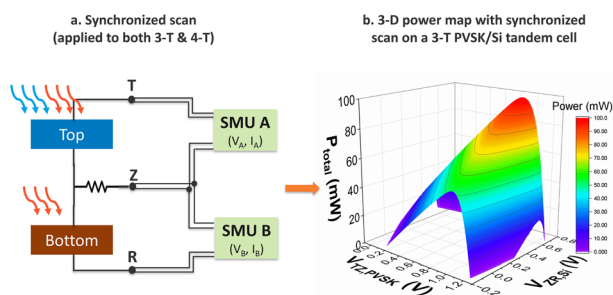
Abhijit Singha, Tiankai Zhang, Ananta Paul, M. M. Anas, Karthik Raitani, Manas Misra, Subir Manna, Vishnu Kumar, Sudhanshu Mallick, K. R. Balasubramaniam, Pradeep R. Nair,* Feng Gao* and Dinesh Kabra*



381

Performance measurement of emerging 3- and 4-terminal tandem solar cells

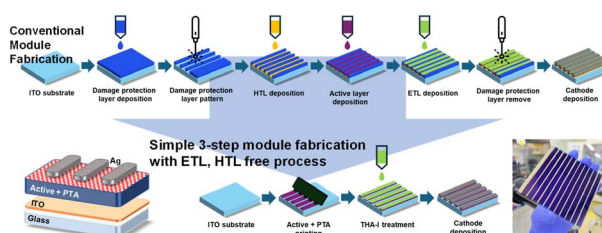
Tao Song,* John F. Geisz, Laurie-Lou Senaud, Lisa Champault, Florent Sahli, Jonas Geissbühler, Bertrand-Paviet Salmon, Quentin Jeangros, Jeremy Brewer, Idris Davis, Rafell Williams, Kaitlyn VanSant and Nikos Kopidakis



392

HTL- & ETL-free metal–semiconductor–metal structure organic solar cells

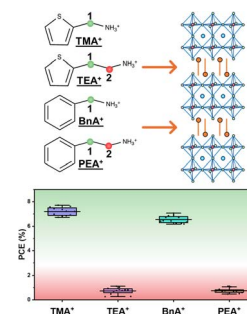
Sujung Park, Hong Nhan Tran, Heunjeong Lee, Seul Lee, Young Wan Lee, Jin Hee Lee, Jina Roe, Muhammad Jahandar, Nurul Kusuma Wardani, Jin Young Kim, Jung Hwa Seo, Hoe-Yeon Jeong, Eun-chae Jeon, Young S. Park, Soyeon Kim, BongSoo Kim,* Dong Chan Lim* and Shinuk Cho*



402

Spacer cation design: promoting vertical orientation in layered perovskites

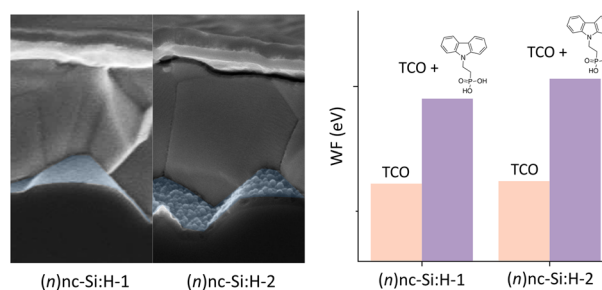
Alice Scardina, Tobias F. Loeff, Vikram, Nada Mrkyvkova, Ruggero Sala, Leonardo Marsano, Herlina Arianita Dewi, Riccardo Pallotta, Annalisa Bruno, Peter Siffalovic, M. Saiful Islam* and Giulia Grancini*



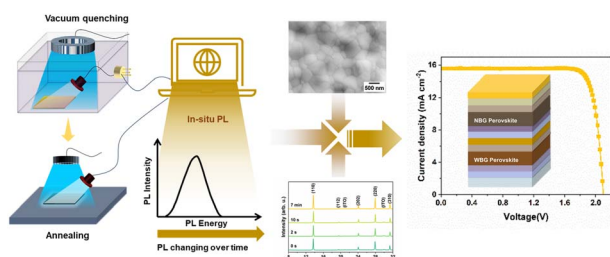
413

Tuning the surface nanoroughness of the recombination junction for high-performance perovskite–silicon tandem solar cells

Yifeng Zhao, Esmat Ugur, Arsalan Razzaq, Thomas G. Allen, Paul Procel Moya, Adi Prasetyo, Imil F. Imran, Cem Yilmaz, Rik Hooijer, Jian Huang, Katarina Kovačević, Yi Zheng, Luana Mazzarella, Erkan Aydin,* Stefaan De Wolf* and Olindo Isabella*



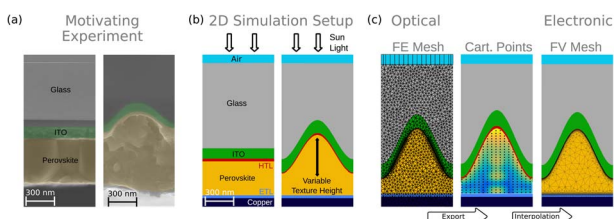
425



Controlling crystallization dynamics of Sn–Pb mixed perovskite films for efficient scalable photovoltaics

Ting Pan, Tonghan Zhao, Roja Singh, Felix Laufer, Weimu Xu, Julian Petermann, Benjamin Hacene, Alexander Diercks, Thomas Feeney, Sachin Kinge, Lingyi Fang, Hang Hu* and Ulrich Wilhelm Paetzold*

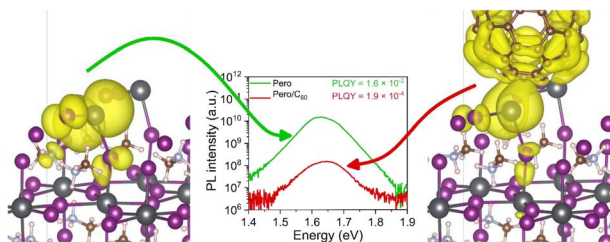
436



How nanotextured interfaces influence the electronics in perovskite solar cells

Dilara Abdel, Jacob Relle, Thomas Kirchartz, Patrick Jaap, Jürgen Fuhrmann, Sven Burger, Christiane Becker,* Klaus Jäger* and Patricio Farrell*

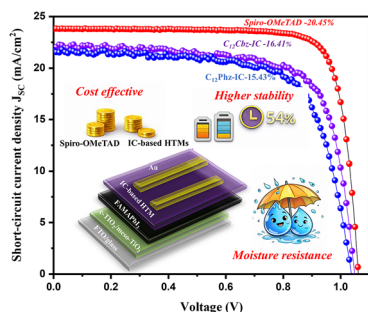
448



Performance limiting defect stabilization by orbital hybridization in perovskite/C₆₀ based solar cells

Richard Gundermann,* Guorui He, Christopher Penschke, Eros Radicchi, Edoardo Mosconi, Filippo De Angelis, Dieter Neher and Felix Lang*

456



Novel dopant-free carbazole- and phenothiazine-appended indolo[3,2-a]carbazole-based small molecules as efficient hole-transport materials for perovskite solar cells

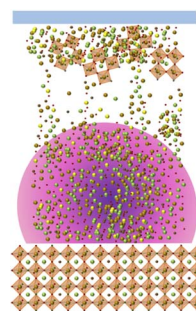
Haritha Jalaja Raghavan, Nideesh Perumbalathodi, Jith C. Janardhanan, Kala Kannankutty, Madambi Kunjukuttan Ezhuthachan Jayaraj, Tzu-Chien Wei* and Narayanapillai Manoj*



469

Magnetron sputtering of hybrid metal halide perovskites: barriers to scalable fabrication

Laxmi Laxmi, Vladimir V. Shilovskikh, Shivam Singh, Sneha Babu, Ronny Engelhard, Boris Rivkin and Yana Vaynzof*



479

Effect of RbF post-deposition treatment on open-circuit voltage in wide-gap (Ag,Cu)(In,Ga)Se₂ solar cells

Rico Gutzler,* Saeed Bayat, Dimitrios Hariskos, Ana Kanevce, Wolfram Hempel, Stefan Paetel, Susanne Siebentritt and Wolfram Witte

