

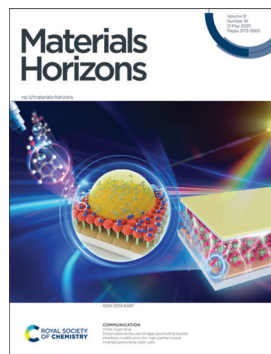
# Materials Horizons

rsc.li/materials-horizons

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 2051-6347 CODEN MHAOAL 12(10) 3173-3560 (2025)



### Cover

See Yimin Xuan *et al.*, pp. 3320–3331. Image reproduced by permission of Yimin Xuan from *Mater. Horiz.*, 2025, 12, 3320.



### Inside cover

See Junichiro Shiomi *et al.*, pp. 3332–3340. Image reproduced by permission of Junichiro Shiomi from *Mater. Horiz.*, 2025, 12, 3332.

## EDITORIAL

3185

**Materials Horizons Emerging Investigator Series:**  
Professor Milad Kamkar, Multiscale Materials Design  
Center, University of Waterloo, Canada



## REVIEWS

3188

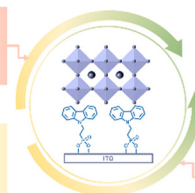
**Self-assembled monolayers for tin perovskite solar cells: challenges and opportunities**

Pengyu Yan, Cheng Wu, Huanhuan Yao, Hongju Qiu and Feng Hao\*

Fine-tuning of deposition methods

- Co-deposition
- ...

Current version of TPSCs with SAMs  
Efficiency: below 10%



Next Version of TPSCs with SAMs  
Efficiency: approaching 15%

- Upgrading SAMs
- Insert polar groups
  - Optimize molecular geometry
  - Design multipodal molecules



# EES Catalysis

GOLD  
OPEN  
ACCESS

## Exceptional research on energy and environmental catalysis

### Open to everyone. Impactful for all

[rsc.li/EESCatalysis](https://rsc.li/EESCatalysis)

Fundamental questions  
Elemental answers

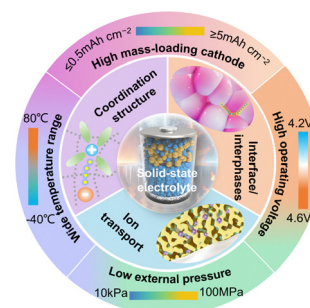


## REVIEWS

3201

### Wide-temperature solid polymer electrolytes: Li<sup>+</sup> coordination structure, ionic transport and interphases

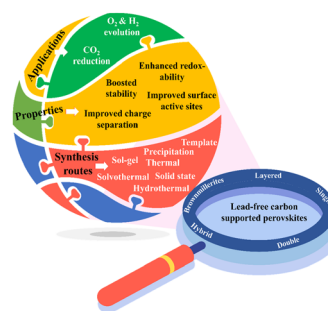
Qingqing Zhou, Minfeng Chen, Junjie Lu, Bifu Sheng, Jizhang Chen,\* Qiaobao Zhang\* and Xiang Han\*



3234

### Recent advances in lead-free carbon supported perovskites based on Z-scheme and S-scheme heterojunctions for photocatalytic energy conversion

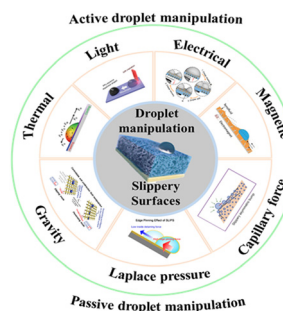
Ritika Soni, Vatika Soni, P. E. Lokhande, Deepak Kumar,\* Nabisab Mujawar Mubarak,\* Seepana Praveenkumar, Raj Kumar, Kulwinder Singh, Udayabhaskar Rednam, Radhamanohar Aepuru and Krishnamoorthy Shanmugaraj



3267

### Advances in small droplets manipulation on bio-inspired slippery surfaces: chances and challenges

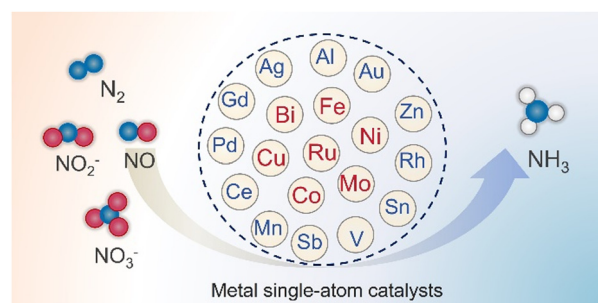
Wenhao Zhang, Xiaobo Wang and Zhiguang Guo\*



3286

### Recent advances in metal single-atom catalysts for ammonia electrosynthesis

Zhaole Lu, Jijie Zhang, Yuting Wang, Yifu Yu\* and Lingjun Kong\*



## REVIEWS

3301

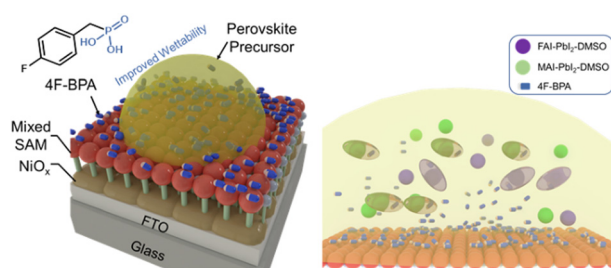
MOFs	NCs@MOF	NCs
High stable	High stable	Less stable
If not Luminescent	Luminescent Mono-emission	Strong Luminescent
Mono-emission	Dual-emission (ratiometric)	Mono-emission
3D Network	Strong emission	Weak emission
Weak catalysis	Strong catalysis	Weak catalysis

### Enhanced biochemical sensing using metallic nanoclusters integrated with metal–organic frameworks (NCs@MOFs): a comprehensive review

Sameera Sh. Mohammed Ameen,\* Khalid M. Omer,\* Farzaneh Shalileh and Morteza Hosseini\*

## COMMUNICATIONS

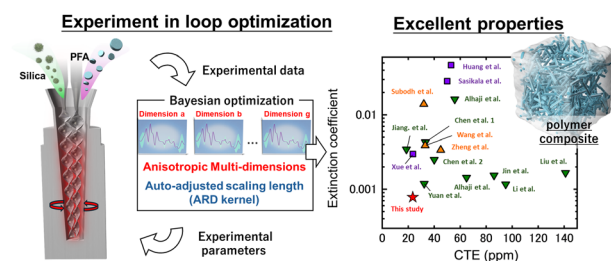
3320



### Dissolvable molecular bridges promoting buried interface modification for high-performance inverted perovskite solar cells

Ruixiong Hu, Likai Zheng, Bin Huang and Yimin Xuan\*

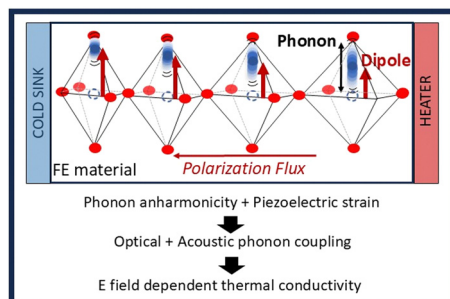
3332



### Experiment-in-loop interactive optimization of polymer composites for “5G-and-beyond” communication technologies

Bin Xu, Touchy Abeda Sultana, Koki Kitai, Jiang Guo, Toyomitsu Seki, Ryo Tamura, Koji Tsuda and Junichiro Shiomi\*

3341



### Electric field-dependent thermal conductivity of relaxor ferroelectric PMN-33PT through changes in the phonon spectrum

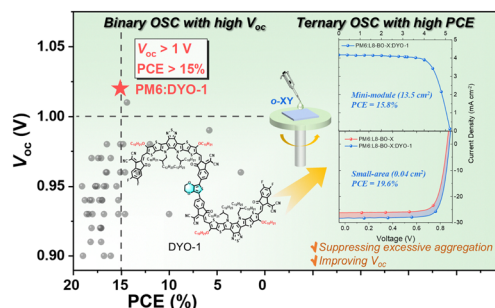
Delaram Rashadfar, Brandi L. Wooten\* and Joseph P. Heremans\*



3349

## A medium bandgap dimeric acceptor with a high open-circuit voltage for efficient organic solar cells

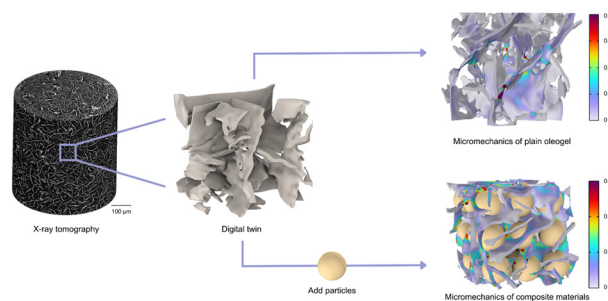
Baofa Lan, Shaohui Yuan, Yanyi Zhong, Wenkai Zhao, Jia Wang, Wendi Shi, Guankui Long,\* Oleg A. Rakitin, Jiangbin Zhang, Kai Han,\* Bin Kan\* and Yongsheng Chen



3358

## Micromechanical finite element modeling of crystalline lipid-based materials: monoglyceride-based oleogels and their composites

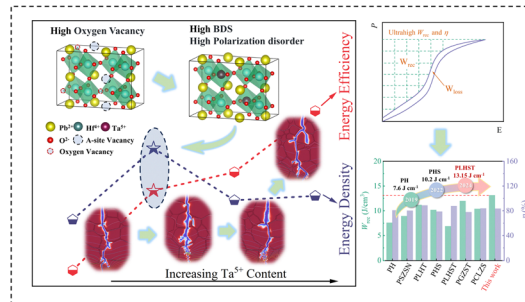
Patrick Grahn,\* Petri Lassila and Fabio Valoppi



3368

## Achieving exceptional energy storage performance in $\text{PbHfO}_3$ antiferroelectric ceramics through defect engineering design

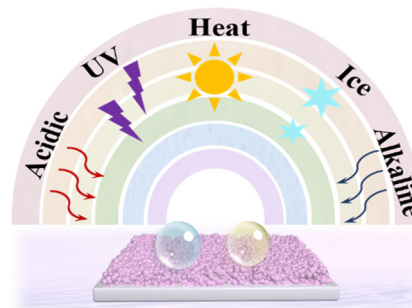
Jiawen Hu, Zhixin Zhou, Ling Lv, Wei Zhang, Sen Chen, Jinjun Liu, Peng Li, Ning Liu,\* Tao Zeng\* and Zhongbin Pan\*



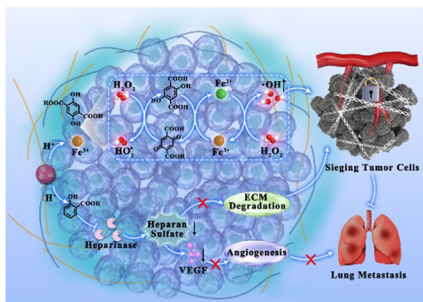
3378

## Organic–inorganic hybridisation strategy for synthesizing durable colored superamphiphobic coatings

Molan Guo, Siyu Zhang, Huayang Zhang, Tianqi Wei, Guangyi Tian, Wen Si and Zhiguang Guo\*



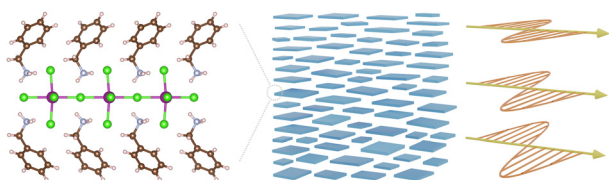
3388



### Sieging tumor cells using an amorphous ferric coordination polymer

Yanli Li, Ruoqi Zhang, Yuanye Dang, Yongyu Liang, Lulu Wang, Na Chen, Luwen Zhuang,\* Wen Liu\* and Teng Gong\*

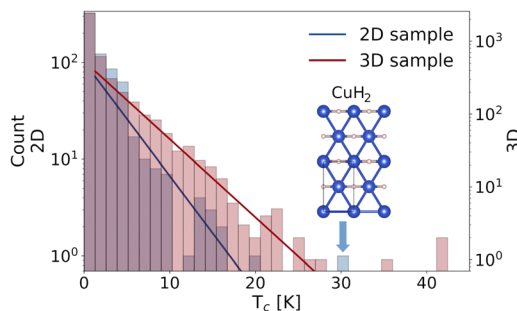
3399



### Semiconducting liquid crystalline dispersions with precisely adjustable band gaps and polarized photoluminescence

Tingting Zhou, Penghao Guo, Xuelian Jiang, Hongbo Zhao, Qing Zhang and Pei-Xi Wang\*

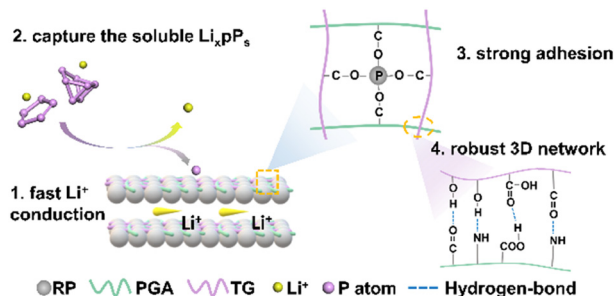
3408



### Machine-learning accelerated prediction of two-dimensional conventional superconductors

Thalis H. B. da Silva, Théo Cavignac, Tiago F. T. Cerqueira, Hai-Chen Wang and Miguel A. L. Marques\*

3420



### Tailoring a multifunctional polyglutamic acid–tragacanth gum binder for enhancing the lithium storage performance of red phosphorus anodes

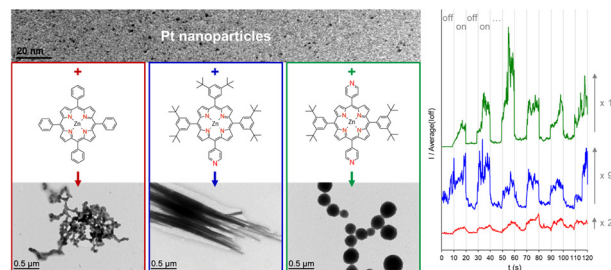
Yanting Li, Bin Zhang,\* Moyuan Cao, Xu Liang, Kar Ban Tan, Shaojie Zhang, Yidian Dong, Yujie Wang, Yiming Zhang, Haochen Gong, Hui Rong, Anjie Dong, Xinpeng Han, Fengmin Jin\* and Jie Sun\*



3429

### Coordination bonds as a tool for tuning photoconductance in nanostructured hybrid materials made of molecular antennas and metal nanoparticles

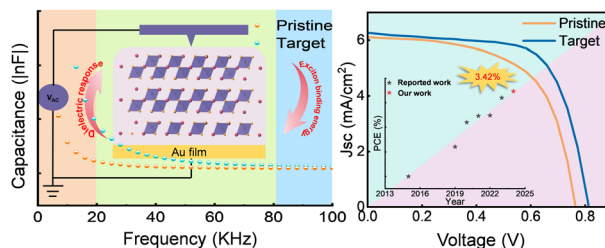
Nataliia Marchenko, Deborah Martin, Adeline Pham, Seifallah Abid, Eva Cretal, Alfonso Ibarra, Delphine Lagarde, Marine Tassé, Jacques Bonvoisin, Gwénaél Rapenne, Jérémie Grisolia, Claire Kammerer\* and Simon Tricard\*



3436

### Reducing exciton binding energy of antimony-based perovskites by improving the phase purity for efficient solar cells

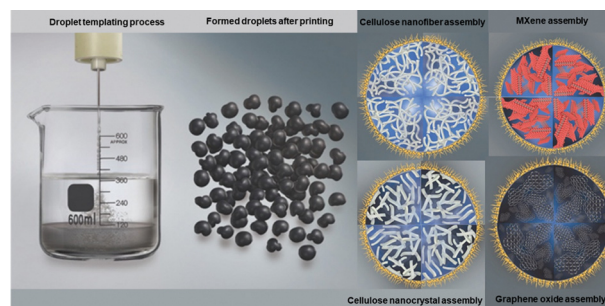
Tengyu Xu, Xian Zhang, Fangzhou Liu,\* Huichao Guo, Jiaqi Zhang, Shaogeng Cai, Deao Li, Yangyang Zhang, Yan Guan,\* Wenjin Yu, Dechun Zou, Lixin Xiao\* and Cuncun Wu\*



3444

### Droplet-templating soft materials into structured bead-based aerogels with compartmentalized or welded configurations

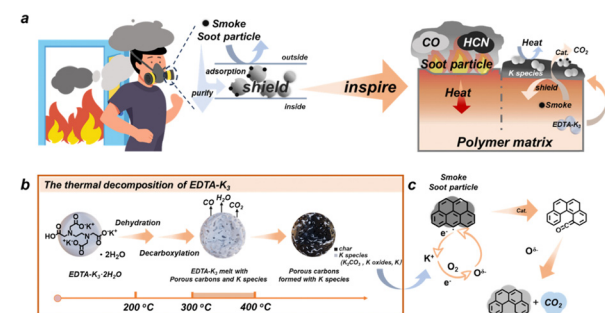
Shayan Ghasemi, Mahyar Panahi-Sarmad, Elnaz Erfanian, Tianyu Guo, Vahid Rad, Adel Jalaei, Gabriel Banvillet, E. Johan Foster, Kam C. Tam, Masoud Soroush, Feng Jiang, Orlando J. Rojas and Milad Kamkar\*



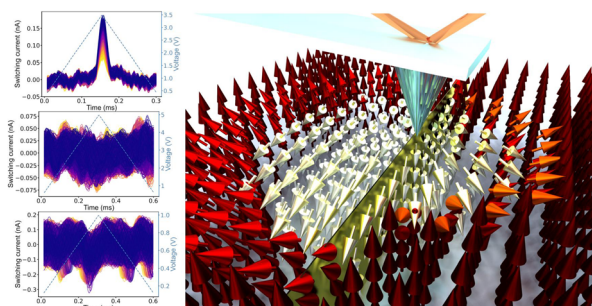
3452

### Respirator-inspired shielding and catalytic oxidation strategies for smoke-suppression polymers, enhancing fire safety

Shuai-Qi Guo, Lei He, Dan-Xuan Fang, Ya-Nan Wu, Fu-Rong Zeng, Ming-Jun Chen, Hai-Bo Zhao\* and Yu-Zhong Wang\*



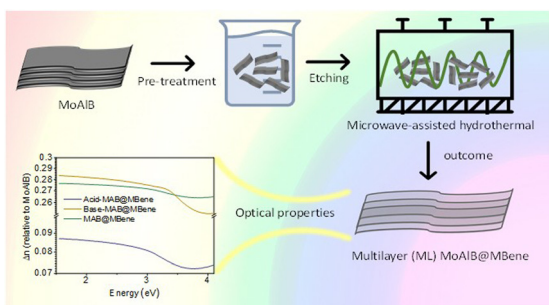
3462



### Differentiating the origins of local charge transfer in oxides and hybrid halides by accumulating charge

Chenxi Wang, Panithan Sriboriboon, Owoong Kwon, Seo-Ryeong Lee, Myeong Seop Song, Jin-Wook Lee, Seung Chul Chae and Yunseok Kim\*

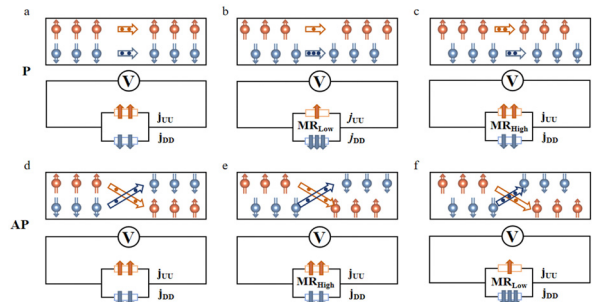
3473



### Multilayered MoAlB@MBene structures using mild microwave-assisted etching and their optical properties

Madhurya Chandel,\* Muhammad Abiyu Kenichi Purbayanto, Dominik Kowal, Dorota Moszczyńska, Anna Wójcik, Muhammad Danang Birowosuto, Michael Naguib and Agnieszka Maria Jastrzębska\*

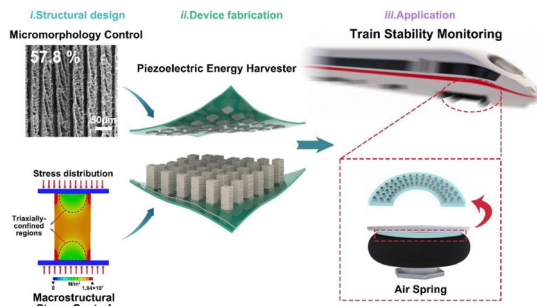
3485



### Origin and enhancement of magnetoresistance in antiferromagnetic tunnel junctions: spin channel selection rules

Xiao Liu, Guorong Yu, Keqian He, Yuxiang Xiao, Sicong Zhu\* and Lei Shen\*

3494



### Significantly enhanced energy harvesting performance in lead-free piezoceramics *via* a synergistic design strategy

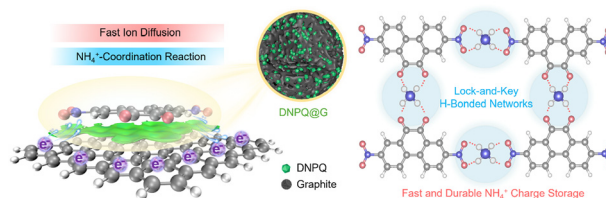
Jianxun Zhang, Qianqian Xu, Yan Zhang,\* Wei Guo,\* Hanmin Zeng, Yimeng He, Jiatao Wu, Longlong Guo, Kechao Zhou and Dou Zhang



3505

### Fast and stable $\text{NH}_4^+$ storage in multielectron H-bonding-acceptor organic molecules for aqueous zinc batteries

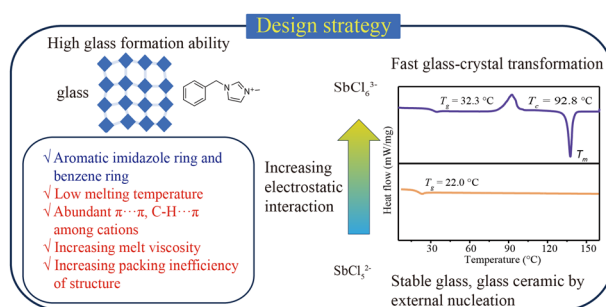
Qi Huang, Ting Shi, Yang Qin, Yaowei Jin, Lu Huang, Yaojie Sun, Chengmin Hu,\* Ziyang Song\* and Fengxian Xie\*



3515

### Regulating intermolecular interactions for stable multifunctional organic–inorganic metal halide hybrid glasses

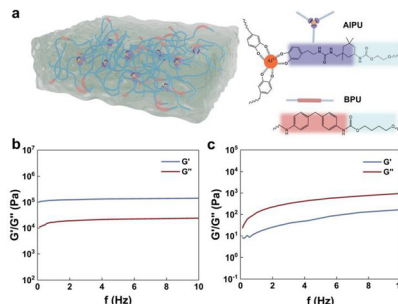
Chunyan Jiang, Jing Yan, Jianrong Qiu, Mingmei Wu\* and Beibei Xu\*



3525

### A linearly programmable strategy for polymer elastomer mechanics

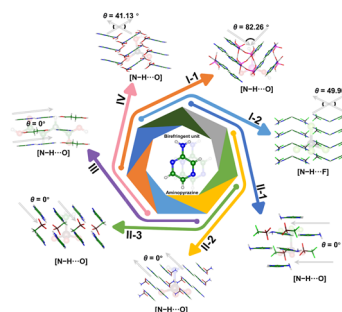
Dichang Xue, Xing Su,\* Jin Xu, Xiaodong Li, Hao Jiang, Lichen Zhang, Zichen Bai, Ruibin Wang, Zitong Deng, Lixiang Zhu, Zhengnan Su and Meishuai Zou\*



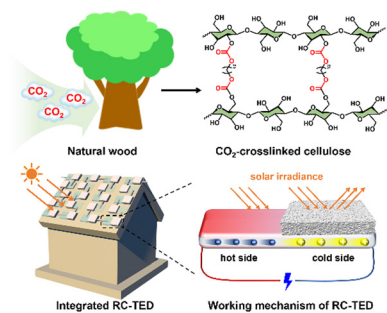
3538

### Optimizing optical anisotropy in low-dimensional structures via intralayer hydrogen bonding modulation and anionic substitution

Muhammad Arif, Xu Liu, Hangwei Jia, Zhihua Yang, Xueling Hou\* and Shilie Pan\*



3546



## CO<sub>2</sub>-crosslinked cellulose for radiative-cooling-driven passive thermoelectric devices: one stone, two birds

Legeng Li, Doudou Xing, Hao Yu, Zhihan Wang, Yingjie Zhou\* and Feng Yan\*

