

Some research activities at the State Key Laboratory of Luminescent Materials & Devices, SCUT

Ning Li

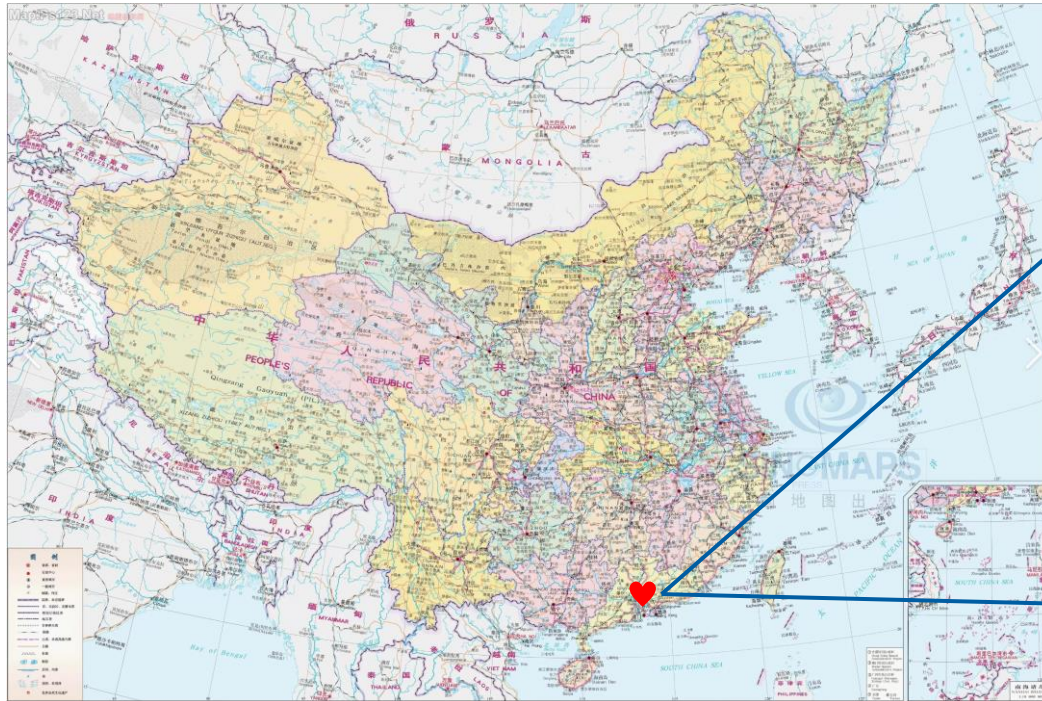
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The location of SCUT

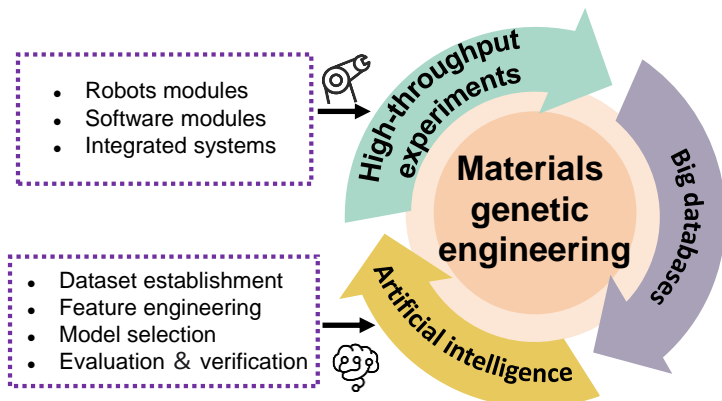


Research on Advanced Optoelectronics using MGE Technologies



Research team @SCUT
October 2023

MGE Accelerates the Research and Development of Organic and Perovskite Photovoltaics



MGE Advances 2024, 2, e28.

Something interesting...

Something interesting



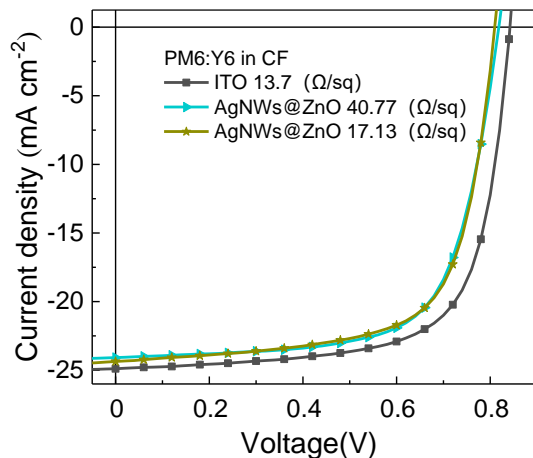
Something interesting



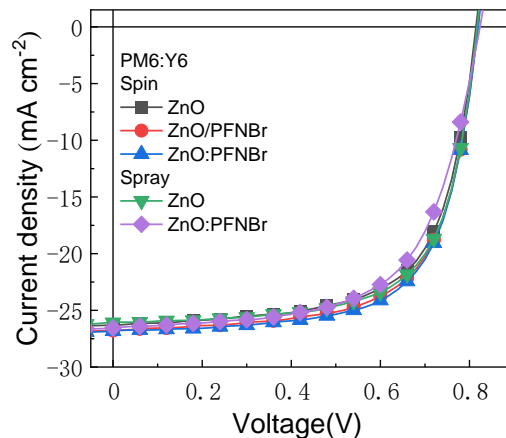
Something interesting

Spray-coated vs. Spin-coated

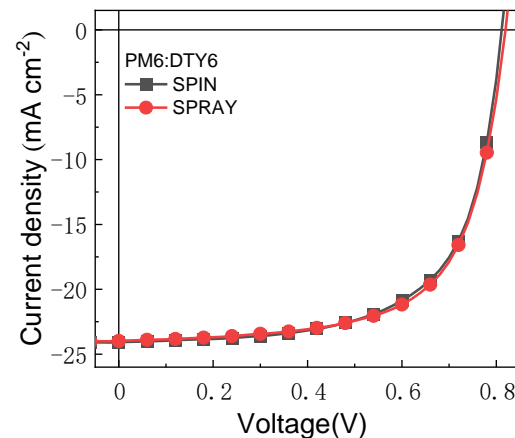
Electrode



Interface layer

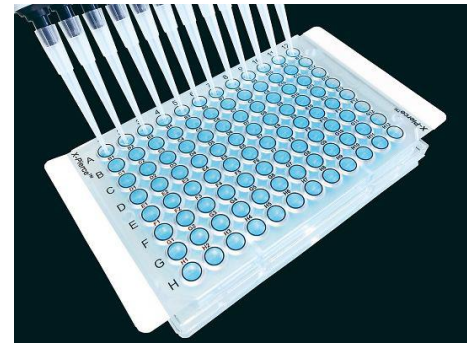


Active layer



Something interesting

Fully automated ultrasonic spray-coating



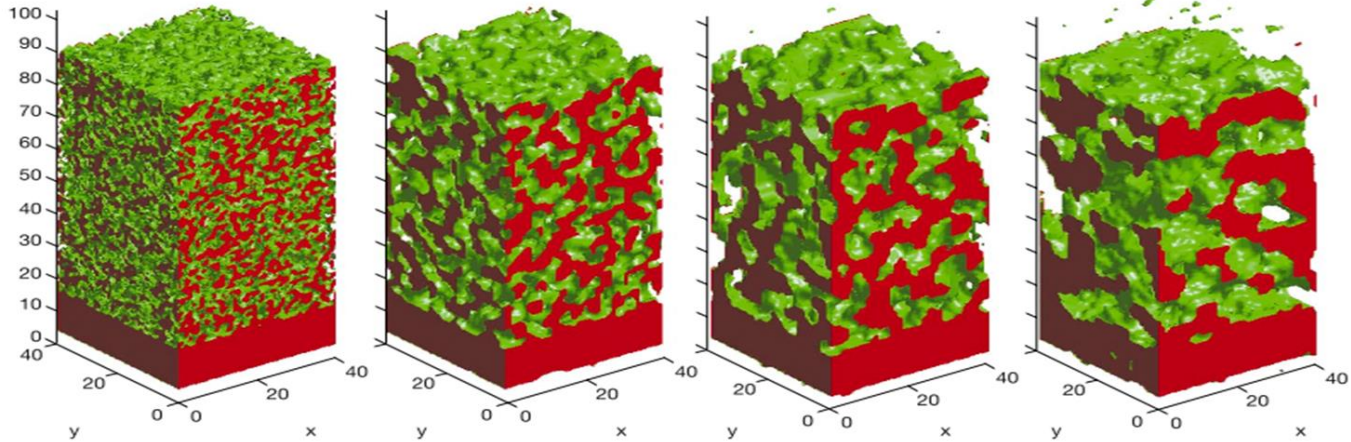
96 → 384 → 1536 samples

Why do we need Big Data?

“Interface is evil”, which is governed by processing

Materials: D:A ratios, Solvents (combina.), Additives (solid, liquid), ...

Processing: Temp., Concen., Techniques, Post-treatments, ...



← Increased D/A Interface

BHJ

Reduced D/A Interface →

AI + HT Experiments for processing optimization

**Multi-dimension
Optimization**

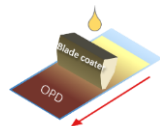
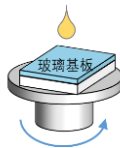
Materials: D:A ratios, Solvents (combinations), Additives, ...
Processing: Temp., Concen., Techniques, Post-treatments, ...

HT- Experiments



Big Data

Auto-Char.



AI

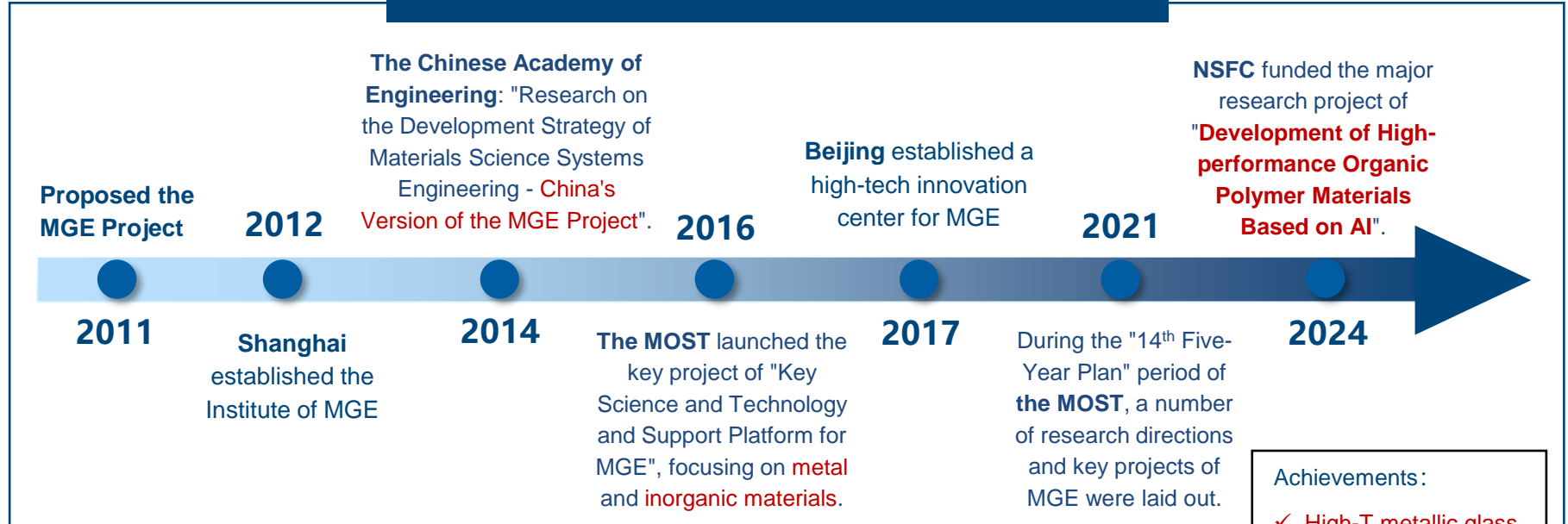


**Process
Efficiency
Stability**

**Target
Applications**

The MGE initiatives in China

Materials research based on MGE



- Some progress has been made on metals and inorganic materials, however, there are relatively few research in the field of **organic optoelectronic materials**.

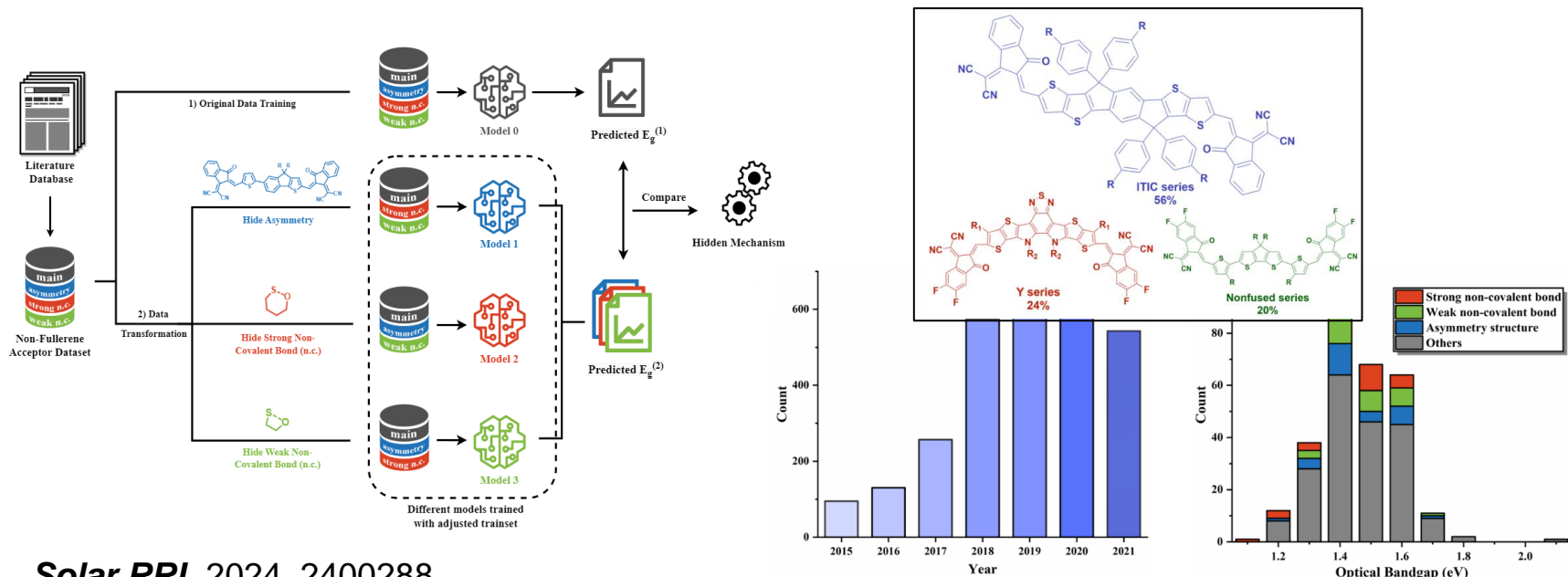
Achievements :

- ✓ High-T metallic glass
Nature 2019, 569, 99
- ✓ High-strength and high-entropy alloy
Nature 2018, 563, 546

Past, Present and Future ...

A database of the optical features of NFAs

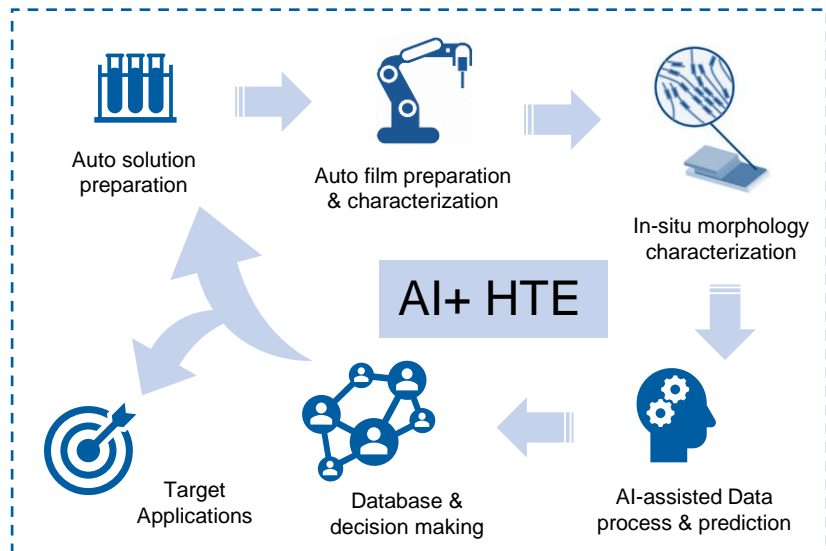
- >3,000 papers published from 2015 to 2021 were reviewed to establish a database of optoelectronic properties of ~300 NFAs.
- The relationship between materials structure and the optical features was studied.



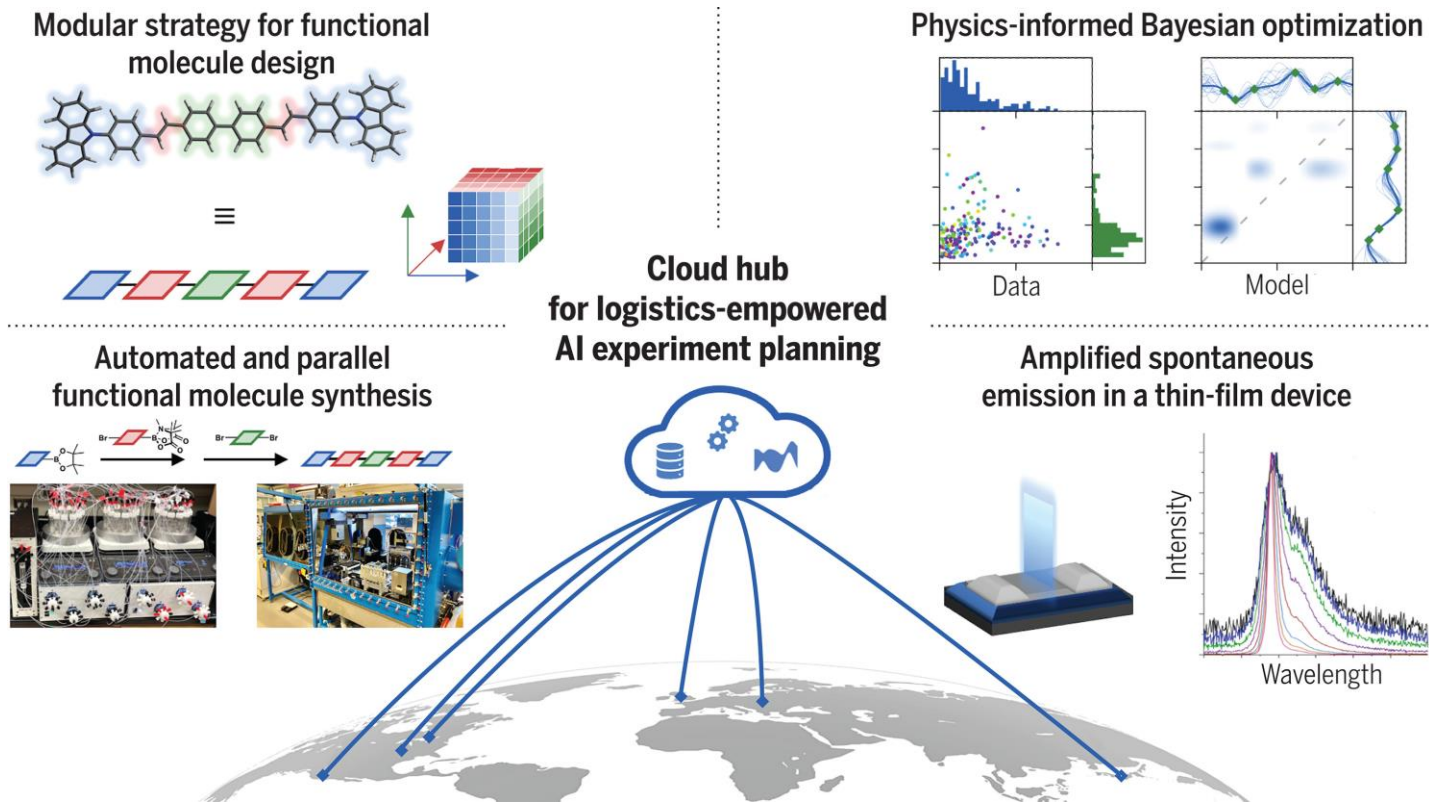
Solar RRL 2024, 2400288.

The progress of HT experiment platform

- ❑ High-throughput automated experimental platform for **Organic** and **Perovskite** research
@ State Key Lab of Luminescent Materials & Devices, SCUT in Guangzhou
- ❑ The platform is being upgraded to equip with **ML** and **LLM** for advanced research



Delocalized, asynchronous, closed-loop discovery of organic laser emitters



Aspuru-Guzik et. al., *Science* 2024, 384, 10.1126/science.adk9227.



South China University of Technology

Prof. Yong Cao

Prof. Yuguang Ma

Prof. Fei Huang

Prof. Lei Ying

Welcome to Guangzhou



National Natural Science
Foundation of China
国家自然科学基金



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Ministry of Science and Technology of the People's Republic of China

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Topics:

- Advanced materials computation: high-throughput computation, autonomous computation, integrated computational materials engineering, etc.
- Advanced materials experiments: high-throughput preparation and characterization, autonomous experiments, intelligent experiments, etc.
- Data-driven materials science: Materials database, materials big-data technologies, digitalized and intelligent materials R&D.
- Application of MGE technologies in materials R&D.



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Special Issue