

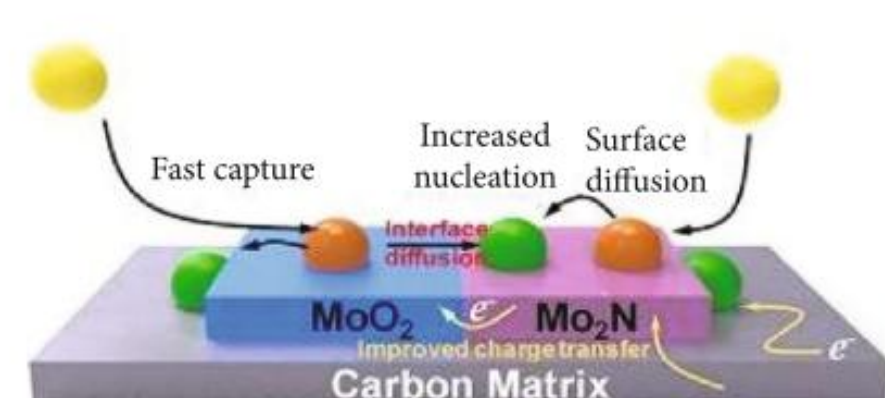
Scalable Nanostructured Transition Metal Nitrides Electrocatalysts for Advanced Li-S Pouch Cells in Drone Power Systems

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We report the development of an advanced multilayer lithium–sulfur (Li–S) pouch cell tailored for drone power systems. A facile synthesis of nanostructured transition metal nitrides embedded in carbon spheres (TMN@C) yields a high-performance electrocatalyst that enhances sulfur utilization. Incorporated in the cathode, TMN@C enables excellent electrochemical stability and robustness. As a result, Li–S pouch cells were assembled to power modern drone systems.

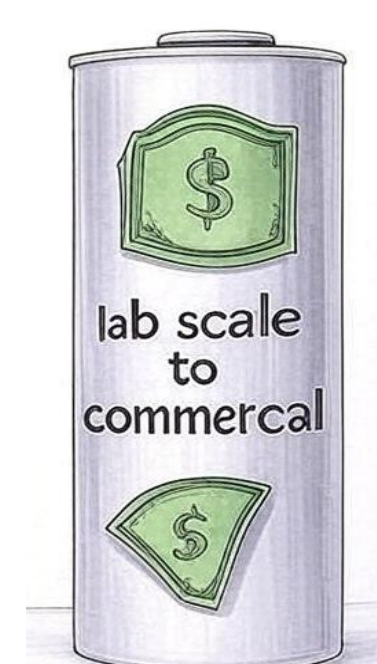
MOTIVATION

Lithium–sulfur (Li–S) for powering advanced electrical systems (e.g. drones)



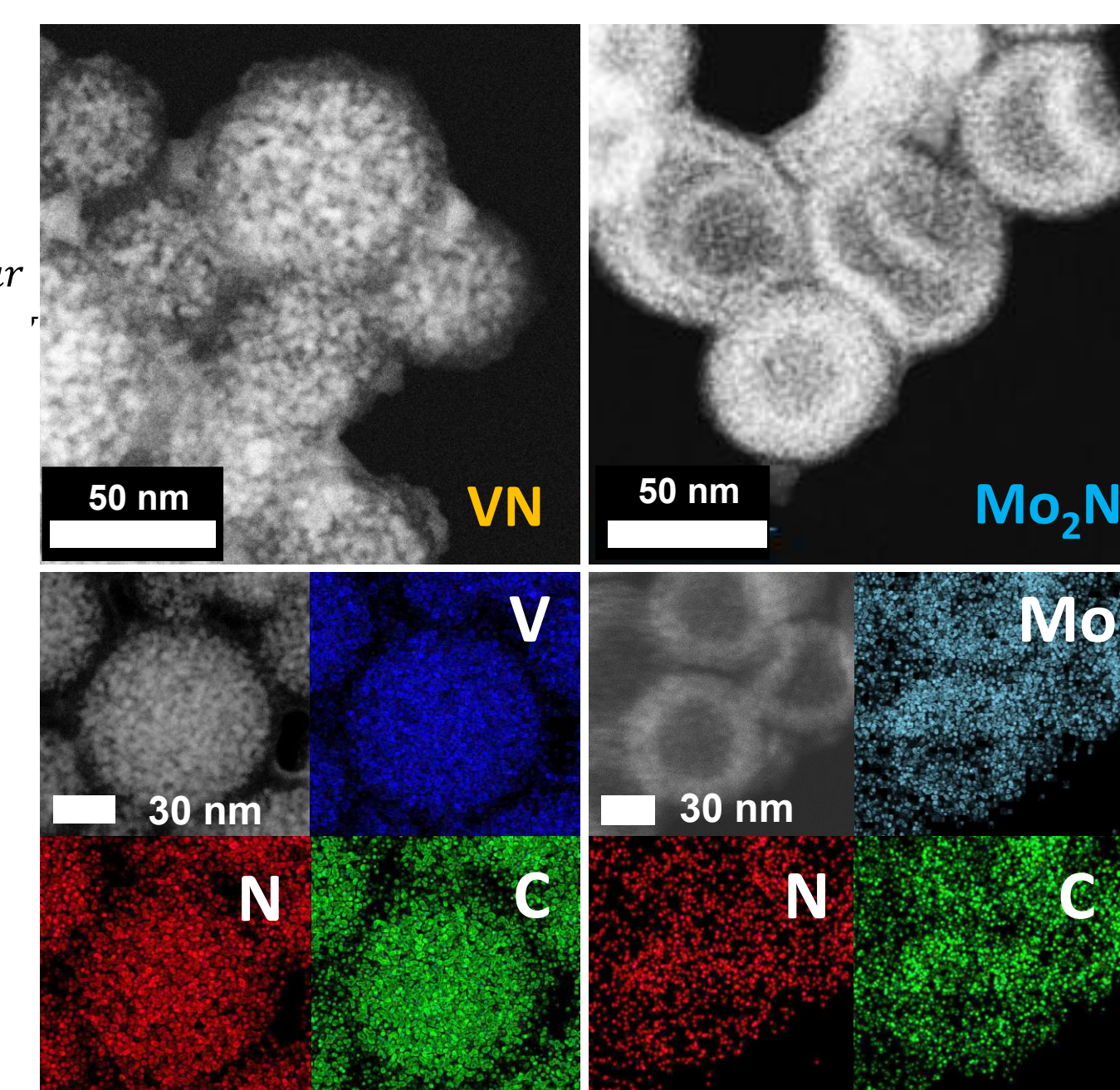
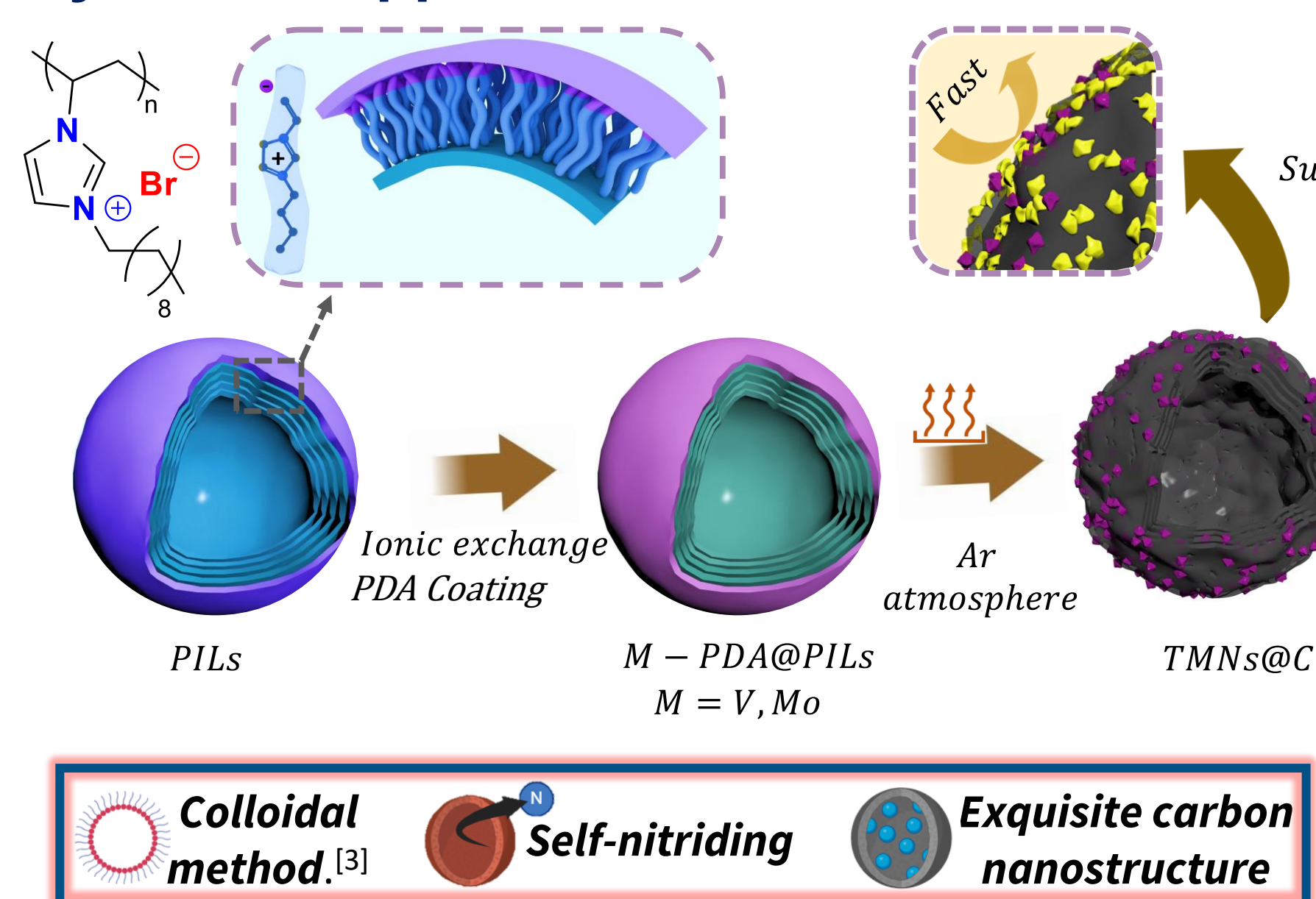
Electrocatalytic materials to overcome the sulfur limitations

Novel materials validated in the lab scale, but scaling them commercially requires solving cost, safety and consistency issues.



SELF-NITRIDING NANOSTRUCTURED TMN@C

Synthesis approach



PILs: poly(ionic liquid)s

PDA: polydopamine

TMNs: transition metal nitrides

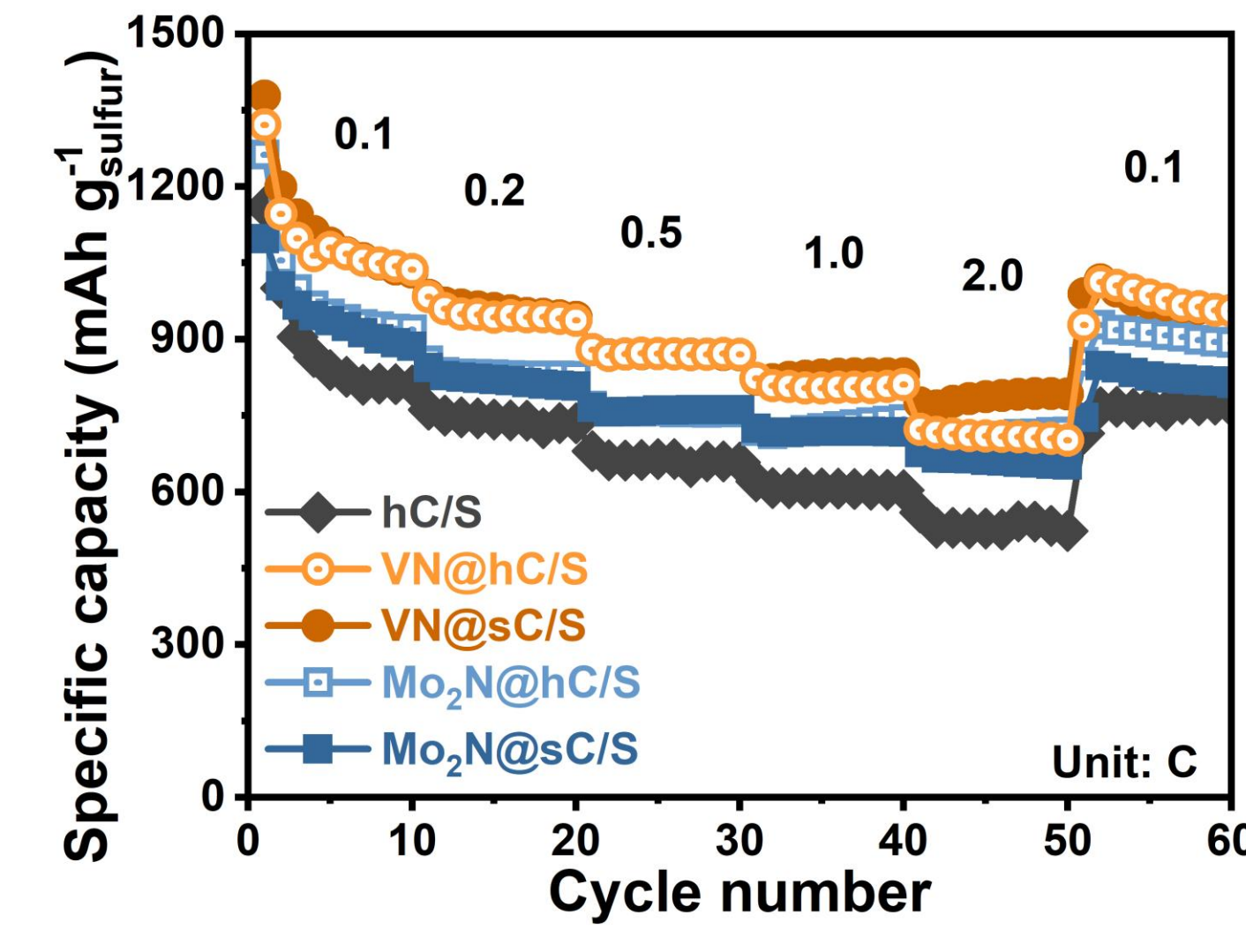
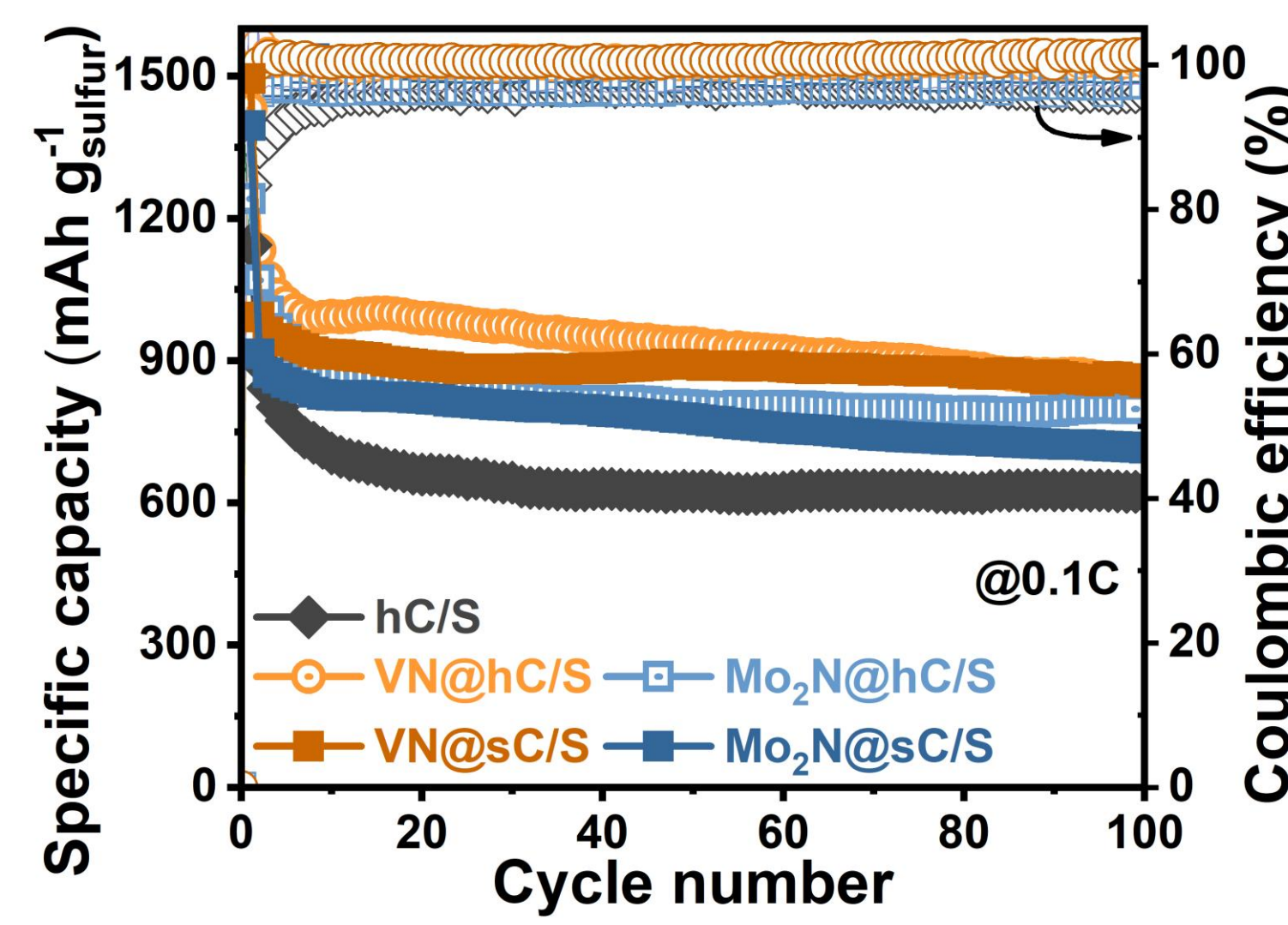
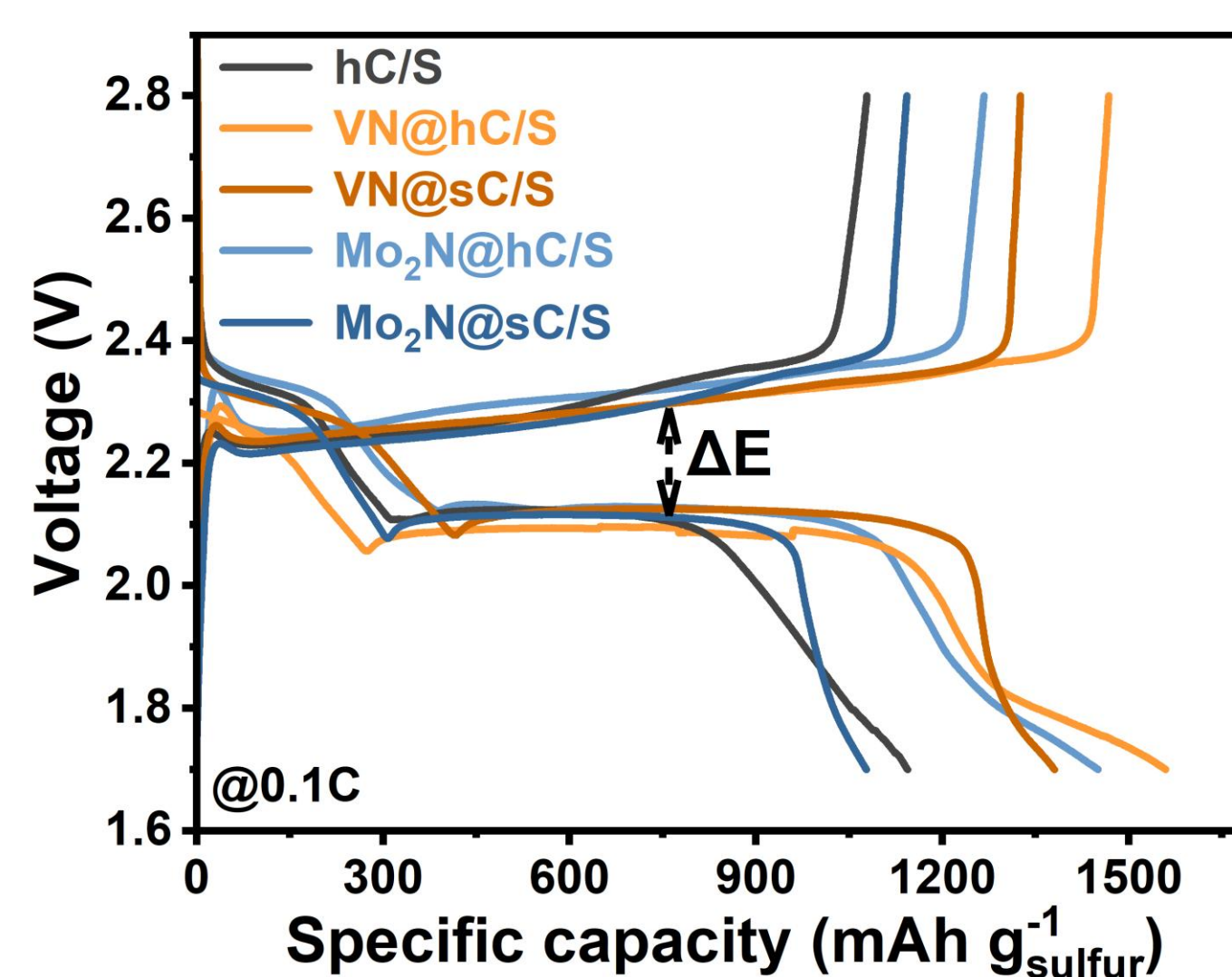
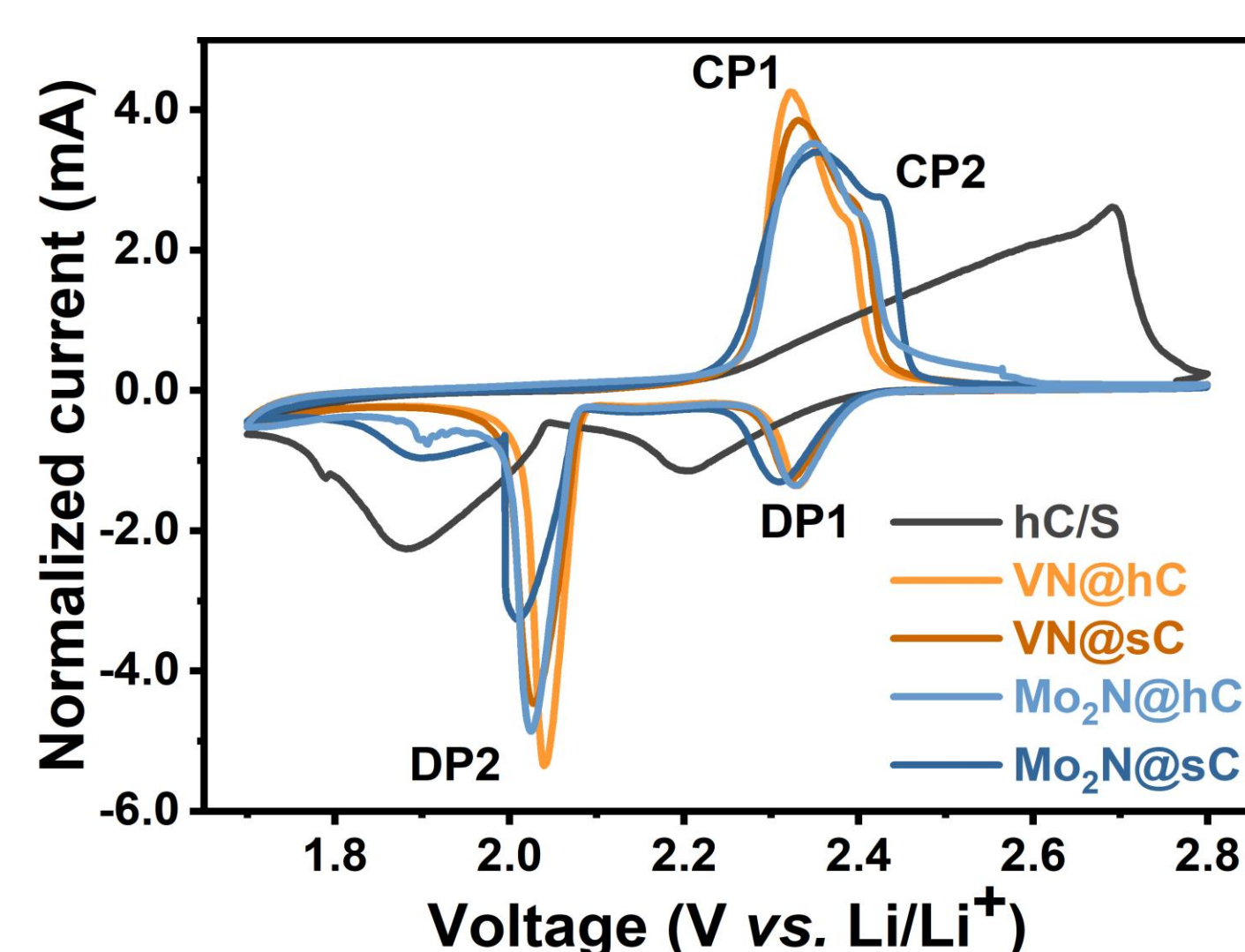
Simple synthesis makes large-scale expansion possible

❖ Direct nitrogen donor via decomposition mechanism (EcoNitro Tech.)



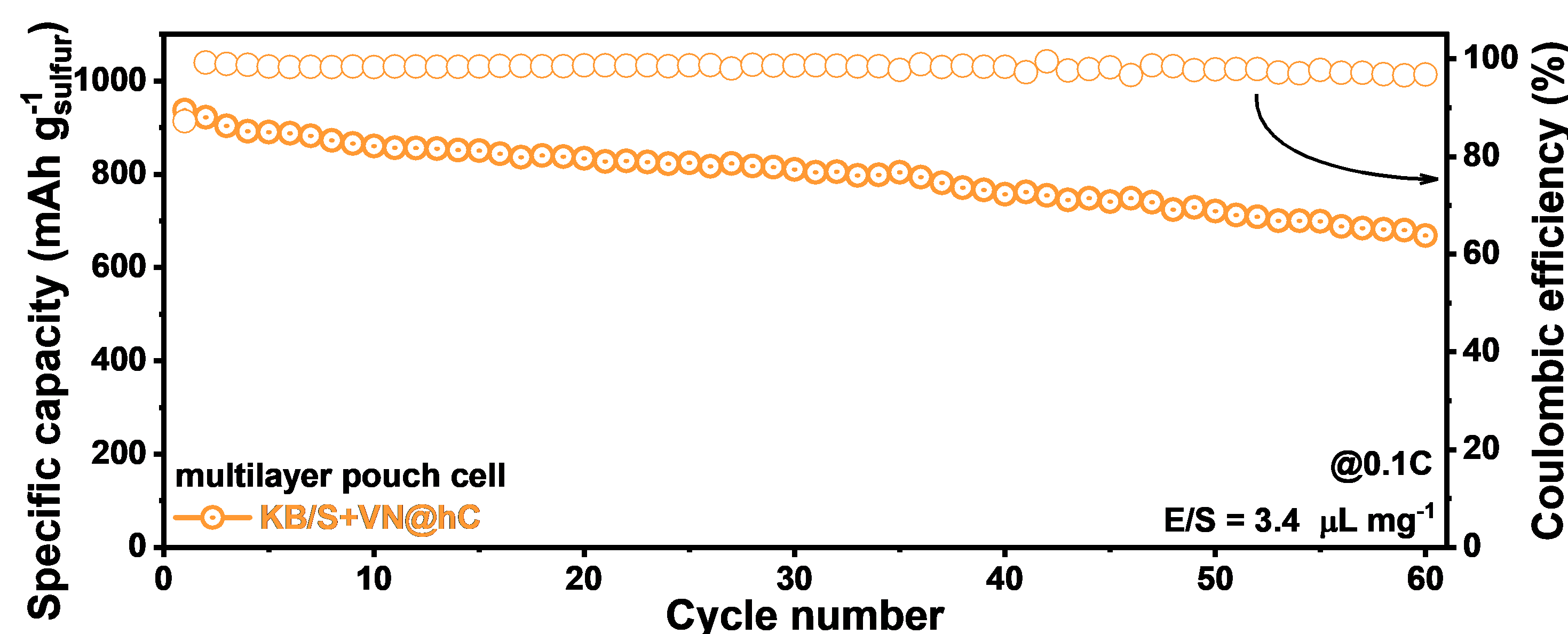
Nitrogen atoms react with the metal precursor to form TMNs without any reactive gas atmosphere

ELECTROCHEMICAL PERFORMANCE OF COIN CELL



POUCH CELL FOR DRONE APPLICATION

- ✓ Remarkable reversibility
- ✓ Boosted redox kinetics
- ✓ High sulfur content
- ✓ Low metal additives content



Take-Home:

In brief, the introduction of TMN@C significantly improved the electrochemical performance of sulfur, even in Li-S multilayer pouch cells with 5 wt.% electrocatalyst content and remarkable energy density. The Li-S pouch cells meet the stringent power and endurance demands of modern aerial platforms, demonstrating the promise of TMN@C as a scalable electrocatalyst from lab to commercial next-generation energy storage.

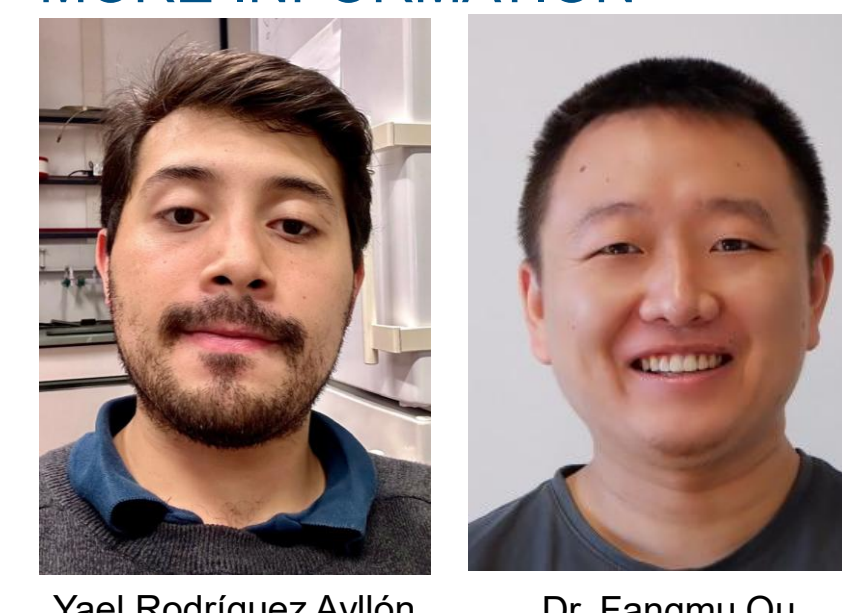
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MORE INFORMATION



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