

Operando Neutron Imaging of Dynamic Electrolyte Wetting and Redistribution in Lean-electrolyte Li-S pouch cells

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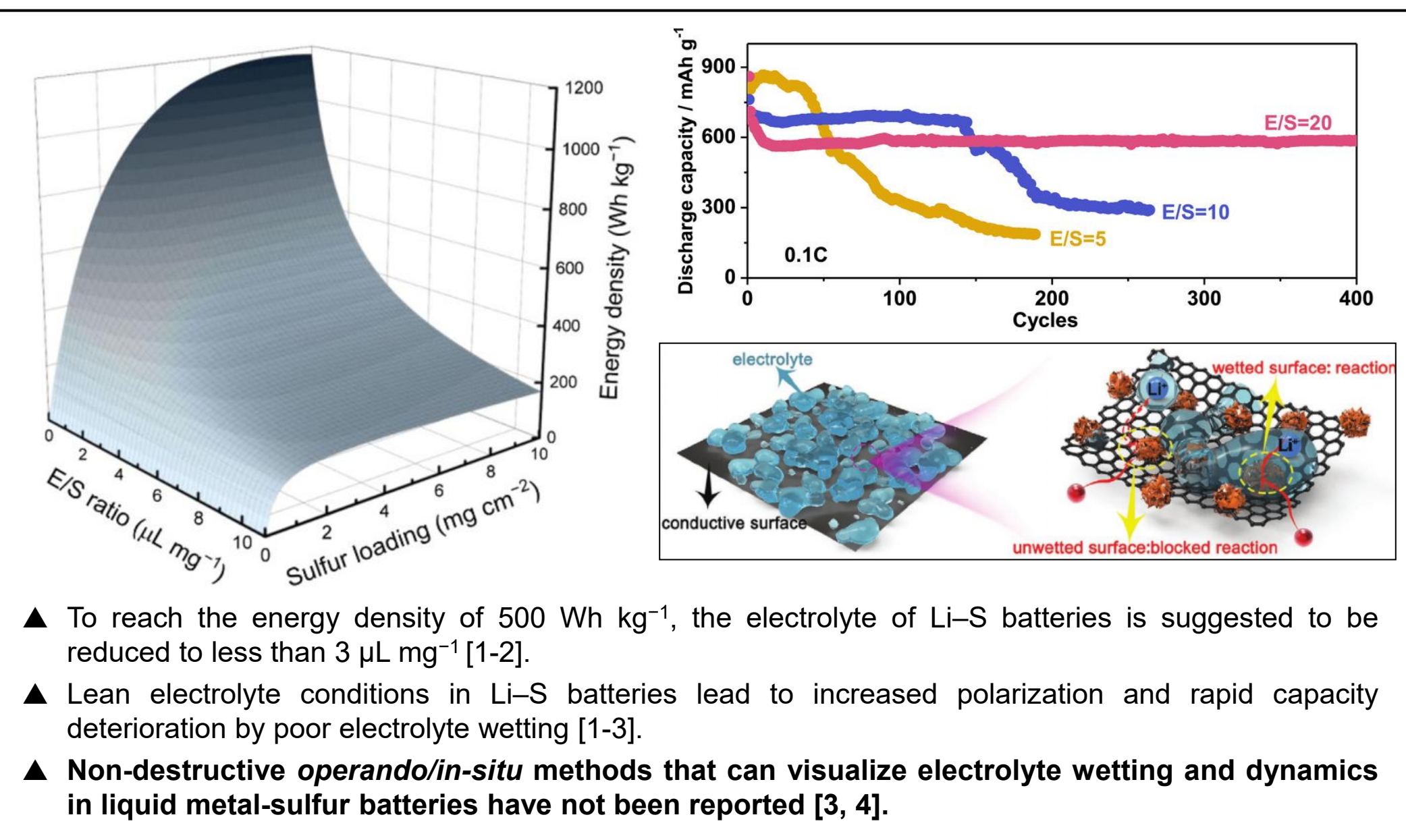
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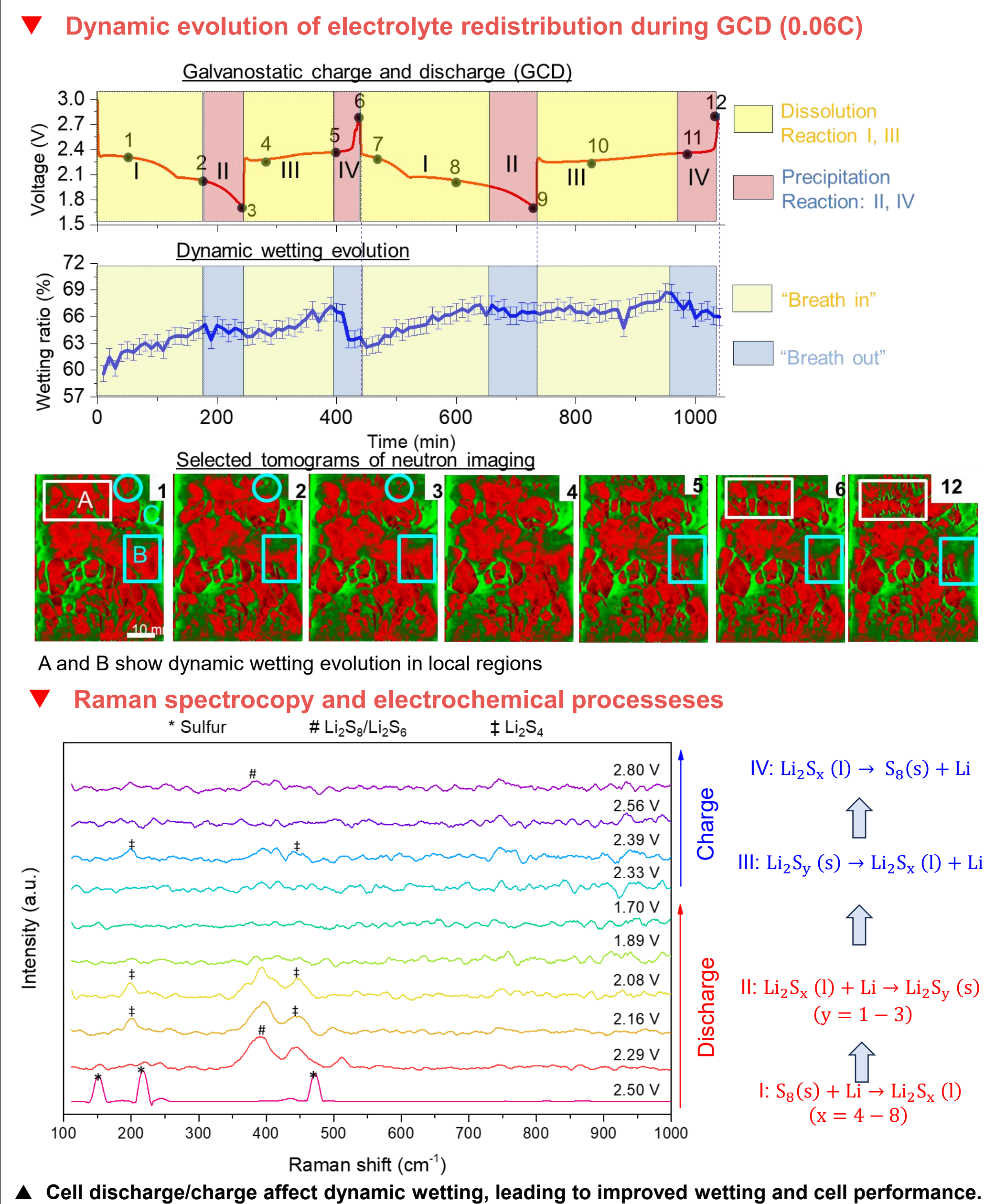
ABSTRACT

In lithium-sulfur (Li-S) batteries, lean electrolyte often causes inhomogeneous wetting and uneven electrochemical reactions, leading to performance loss. Here, *operando* neutron tomography is used to non-destructively visualize electrolyte distribution in lean-electrolyte Li-S pouch cells. Rest and cycling influence electrolyte redistribution, with slow cycling enhancing wetting and sulfur activation. Periodic “breath-in/out” behavior is linked to polysulfide dynamics. These insights guide electrolyte management and cell design in Li-S and other metal-sulfur batteries.

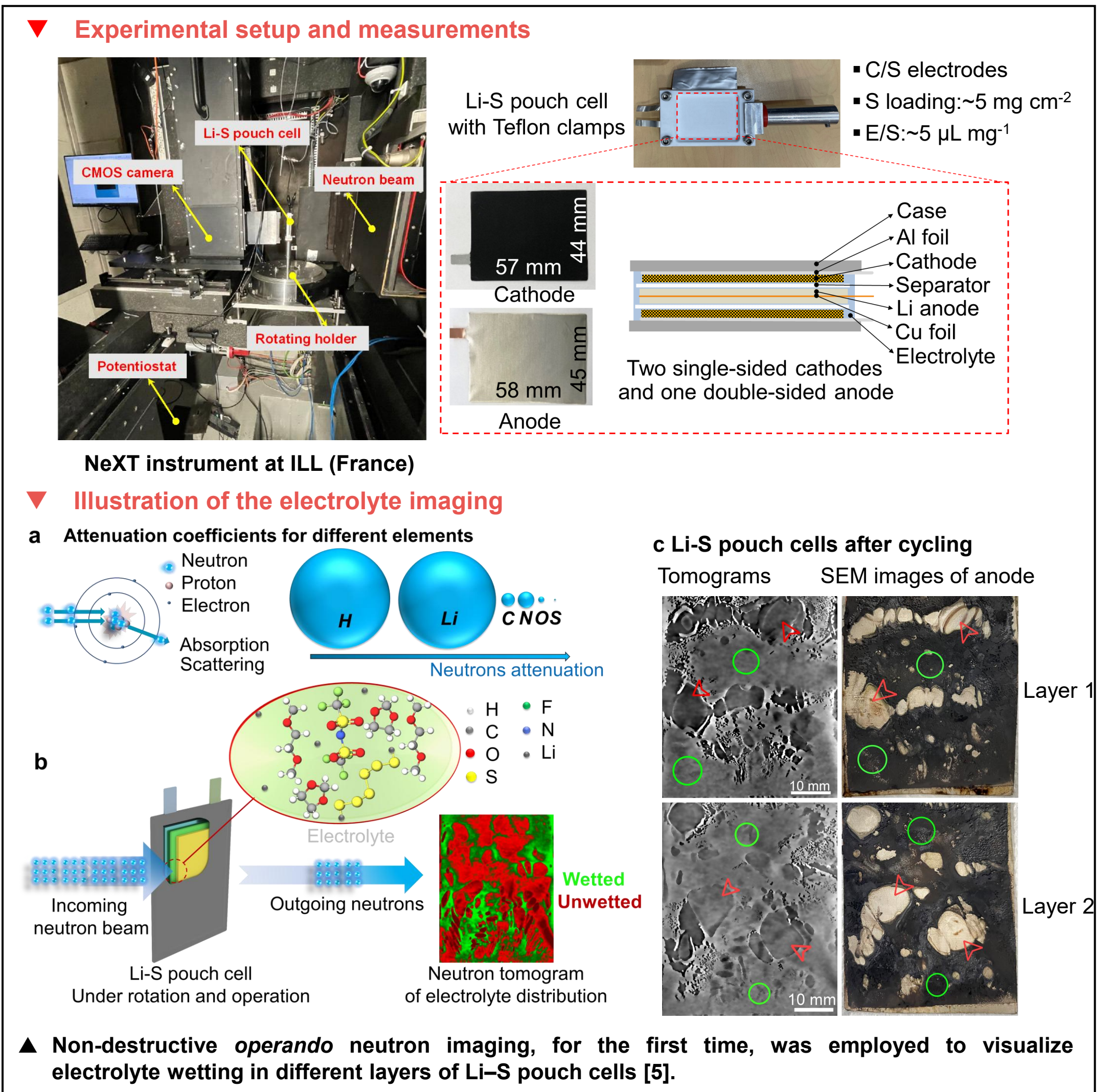
BACKGROUND



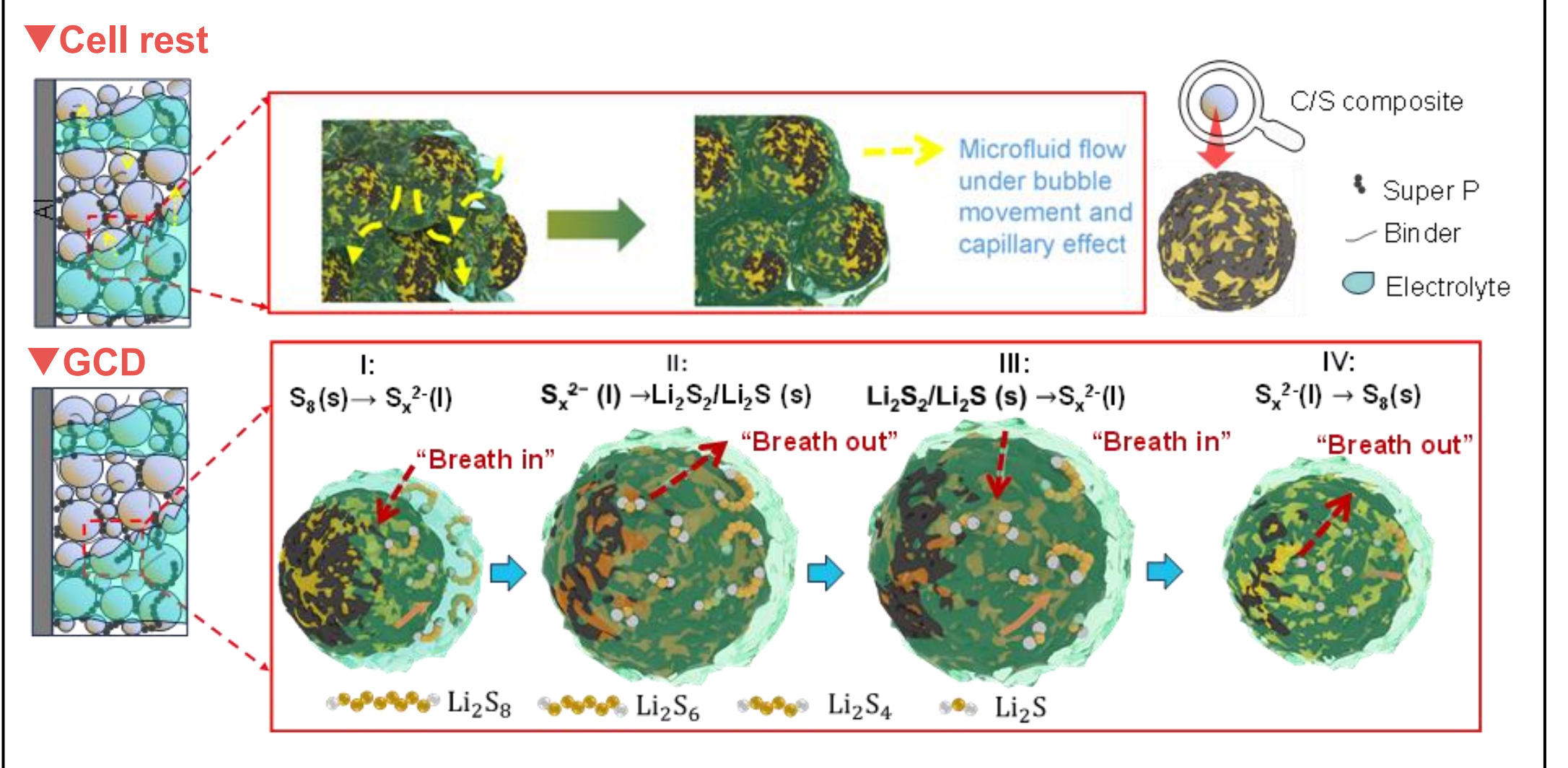
DYNAMIC ELECTROLYTE WETTING DURING CYCLING



OPERANDO NEUTRON IMAGING AND SETUP



DISCUSSION: ELECTROLYTE WETTING MECHANISMS



CONCLUSION

The results confirm that electrolyte wetting in lean-electrolyte Li-S pouch cells is inhomogeneous and highly dynamic, which closely tied to the electrochemical behavior of sulfur species. The observed inhomogeneity and its evolution during rest and cycling—especially the reversible “breath-in” and “breath-out” wetting behavior—underscore the critical role of electrolyte management in achieving uniform reactions and stable performance in liquid metal-sulfur systems.

REFERENCES

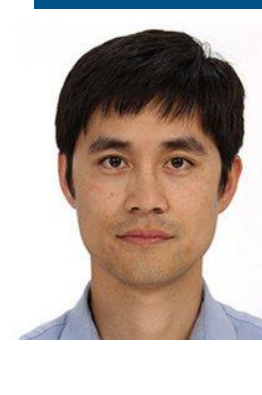
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MORE INFORMATION



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