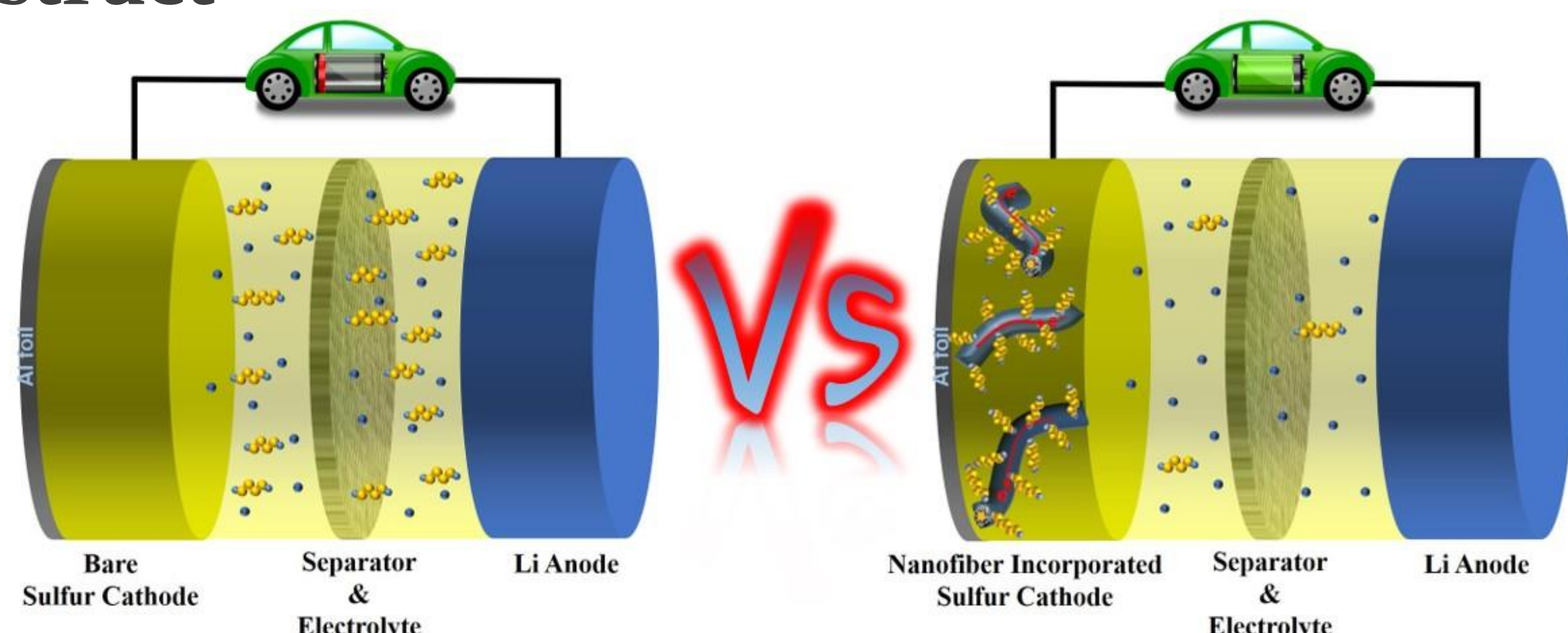


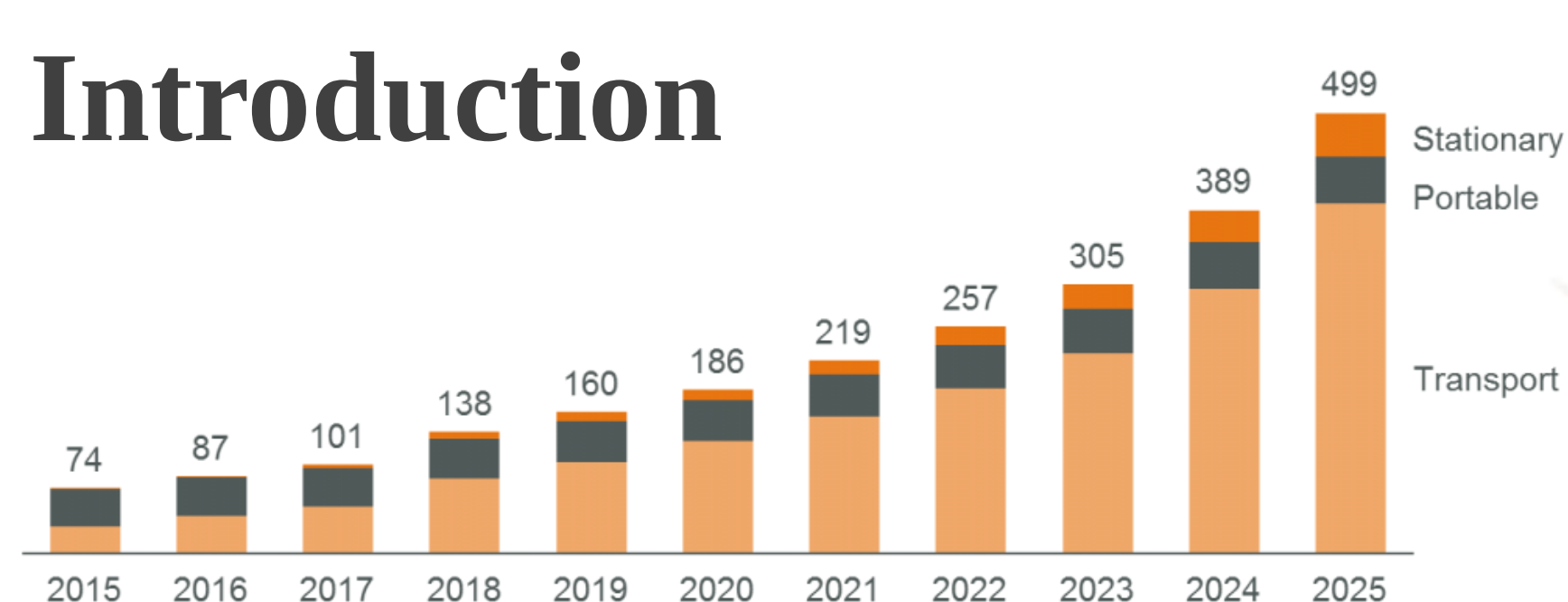
## Nanofibrous Additives for Industrially Viable Lithium-Sulfur Batteries

Avinash Raulo, Bhanu Nandan\*

### Abstract

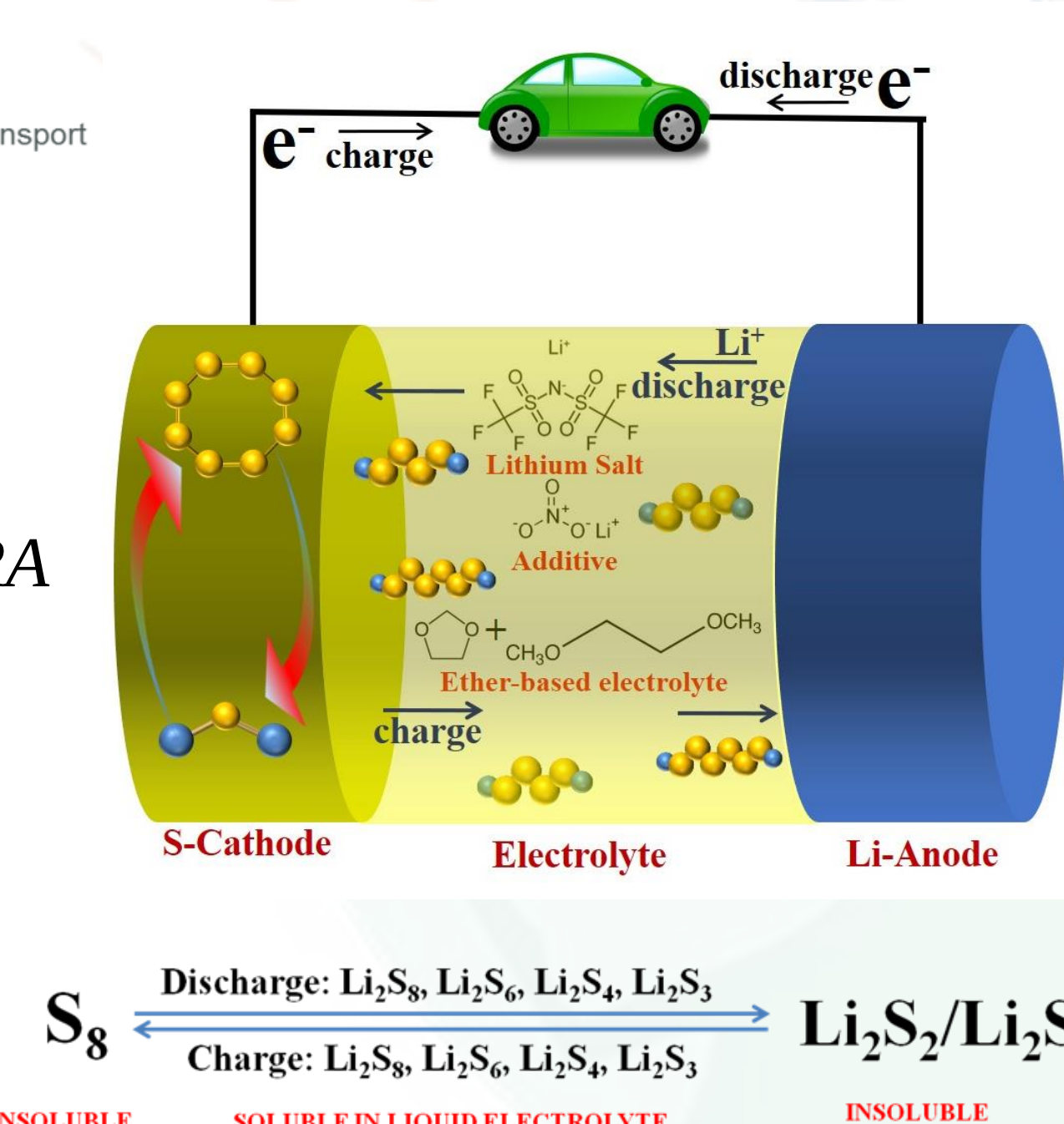


### Introduction

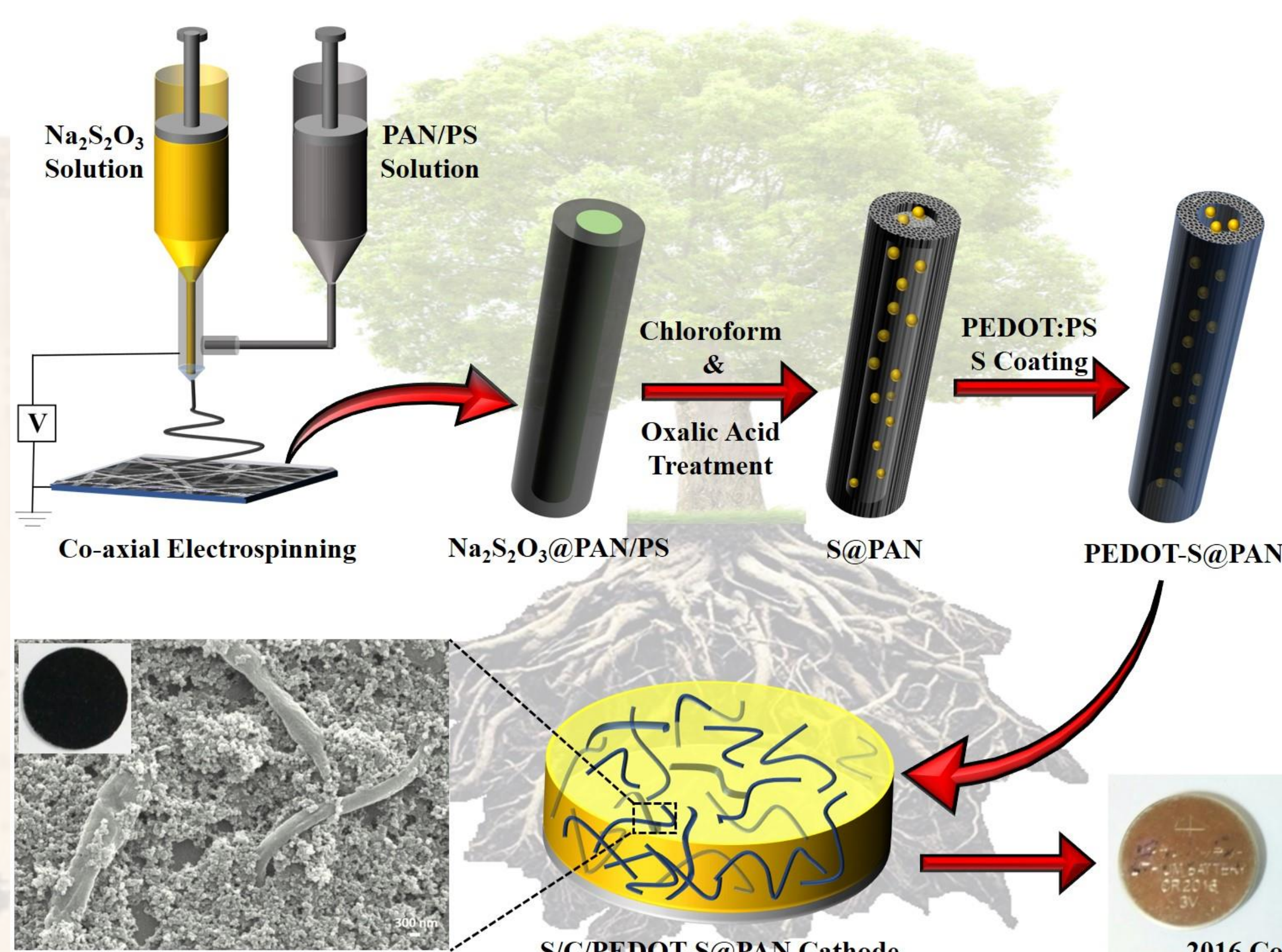


#### Why Li-S Batteries?

| Materials          | Theoretical Capacity (mAh g <sup>-1</sup> ) |
|--------------------|---------------------------------------------|
| Graphite           | 372                                         |
| LiCoO <sub>2</sub> | 274                                         |
| Sulfur             | 1675                                        |



### Materials and Method



Fabrication of S/C/PEDOT-S@PAN cathode for LSB

### Conclusions

- The PEDOT-S@PAN nanofibers anchor the polysulfides reducing shuttle effect
- The incorporation of PEDOT-S@PAN nanofibers in sulfur cathode of LSB improves the specific capacity, cycle-life and rate capability
- The performance of sulfur cathode with only 5 wt. % PEDOT-S@PAN nanofiber incorporation has been tested as a proof-of-concept

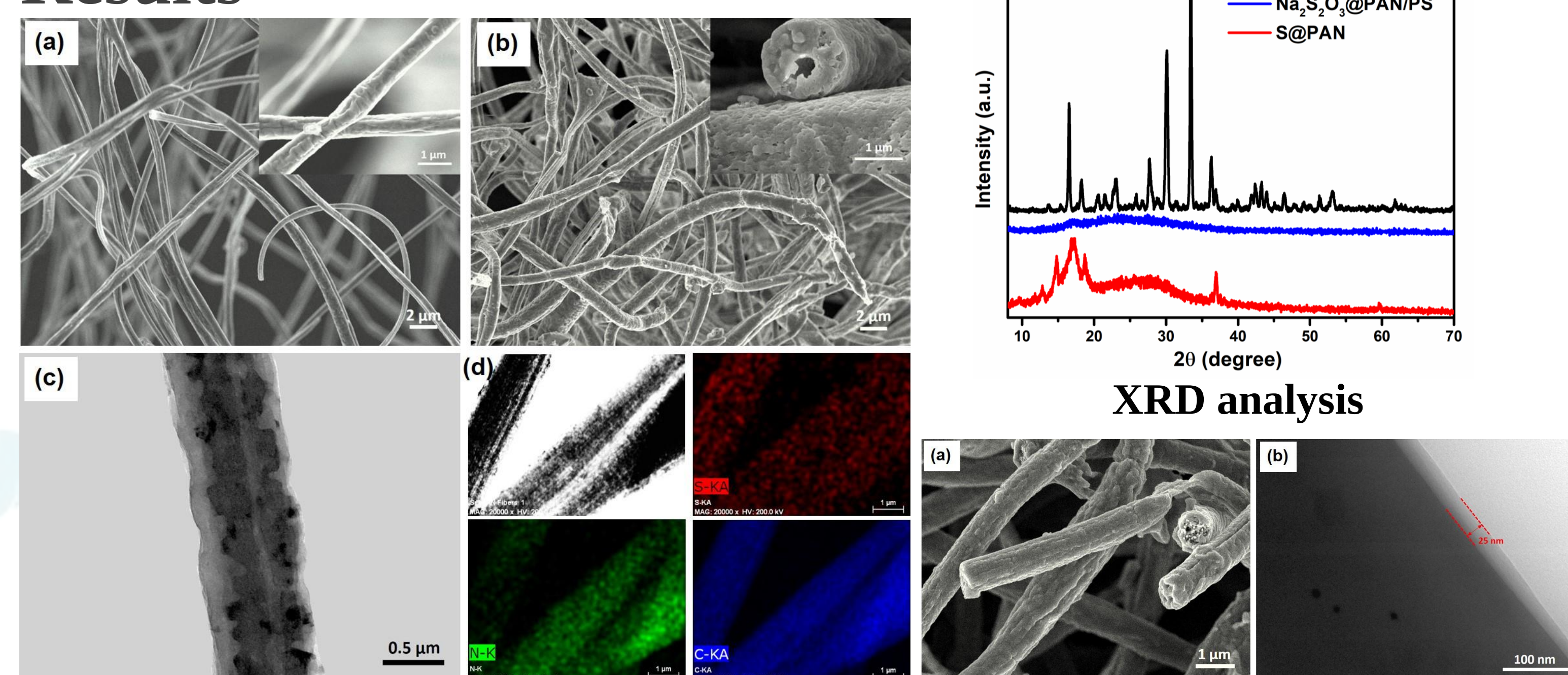
### Technology Readiness Level

- The experimental electrochemical tests on cell level confirmed the potential of PEDOT-S@PAN nanofibers to improve the performance of LSBs
- A reliable Battery Management System (BMS) for Li-S battery pack with S/C/PEDOT-S@PAN cathode is still under development

### Acknowledgement

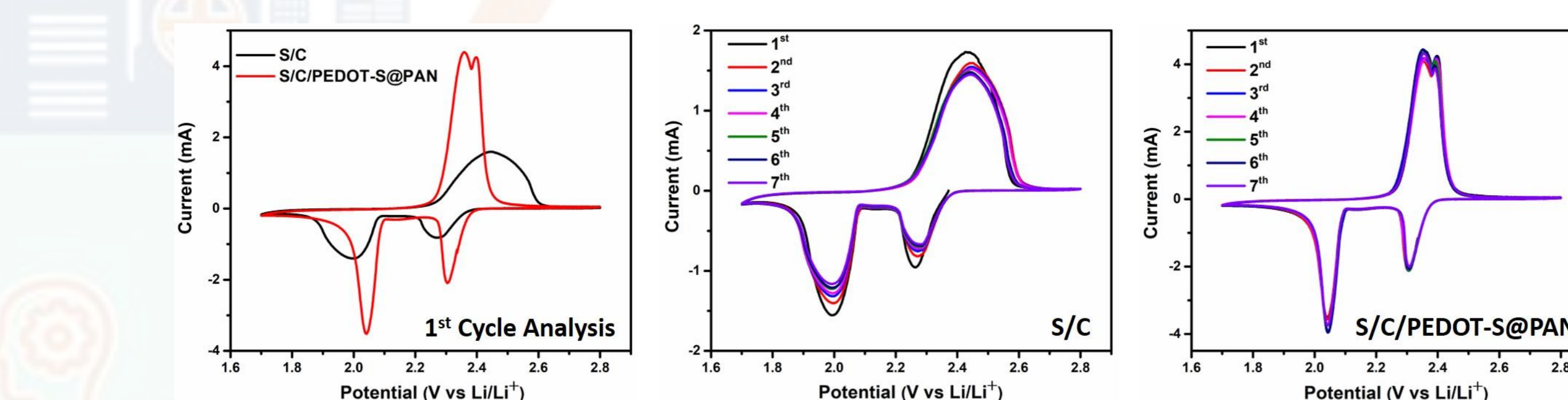
1. This work is supported by the Department of Science and Technology, India (Project No. DST/TMD/MES/2k17/73)
2. Indian Institute of Technology Delhi

### Results

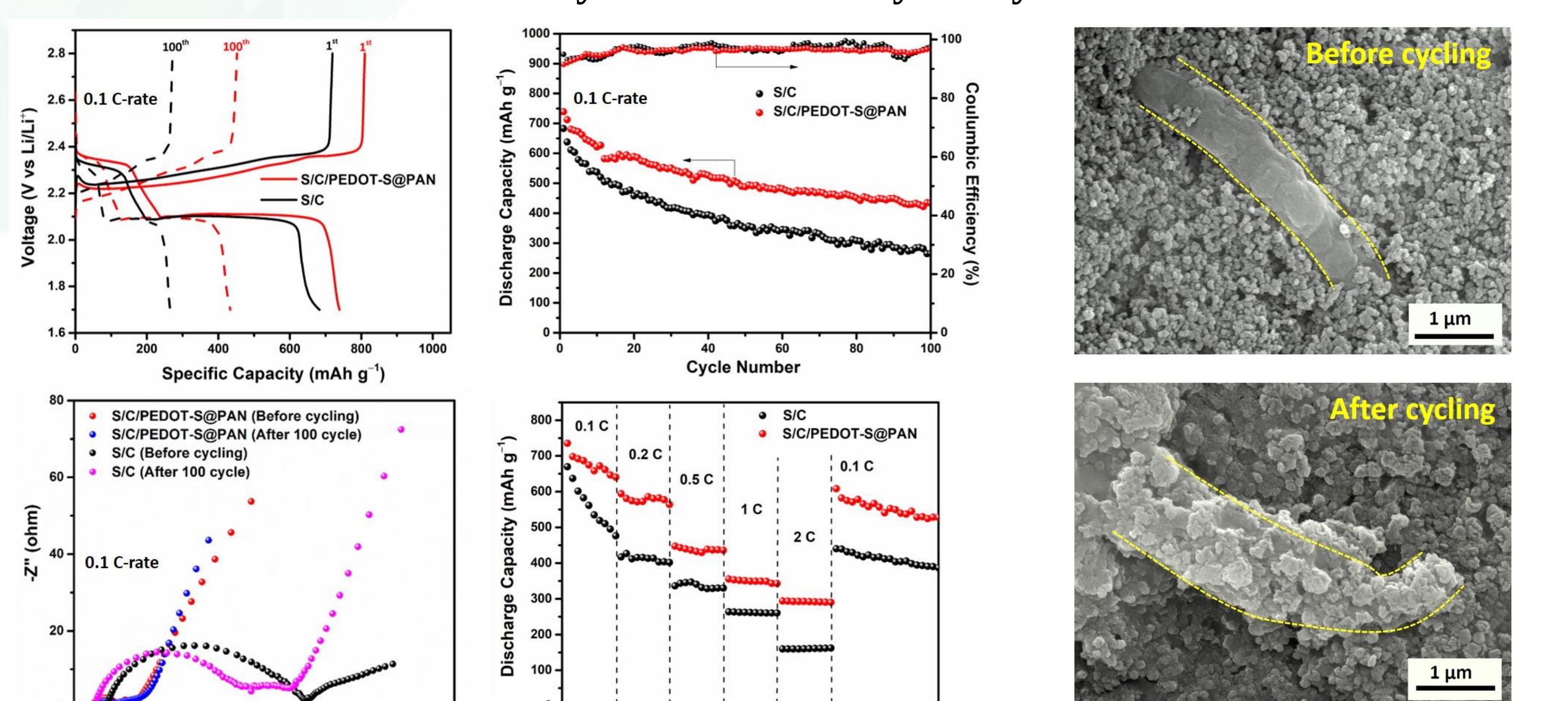


SEM images of (a) Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>@PAN/PS, (b) S@PAN nanofibers, (c) HRTEM, (d) EDX mapping of S@PAN nanofiber

(a) SEM, (b) HRTEM image of PEDOT-S@PAN nanofiber

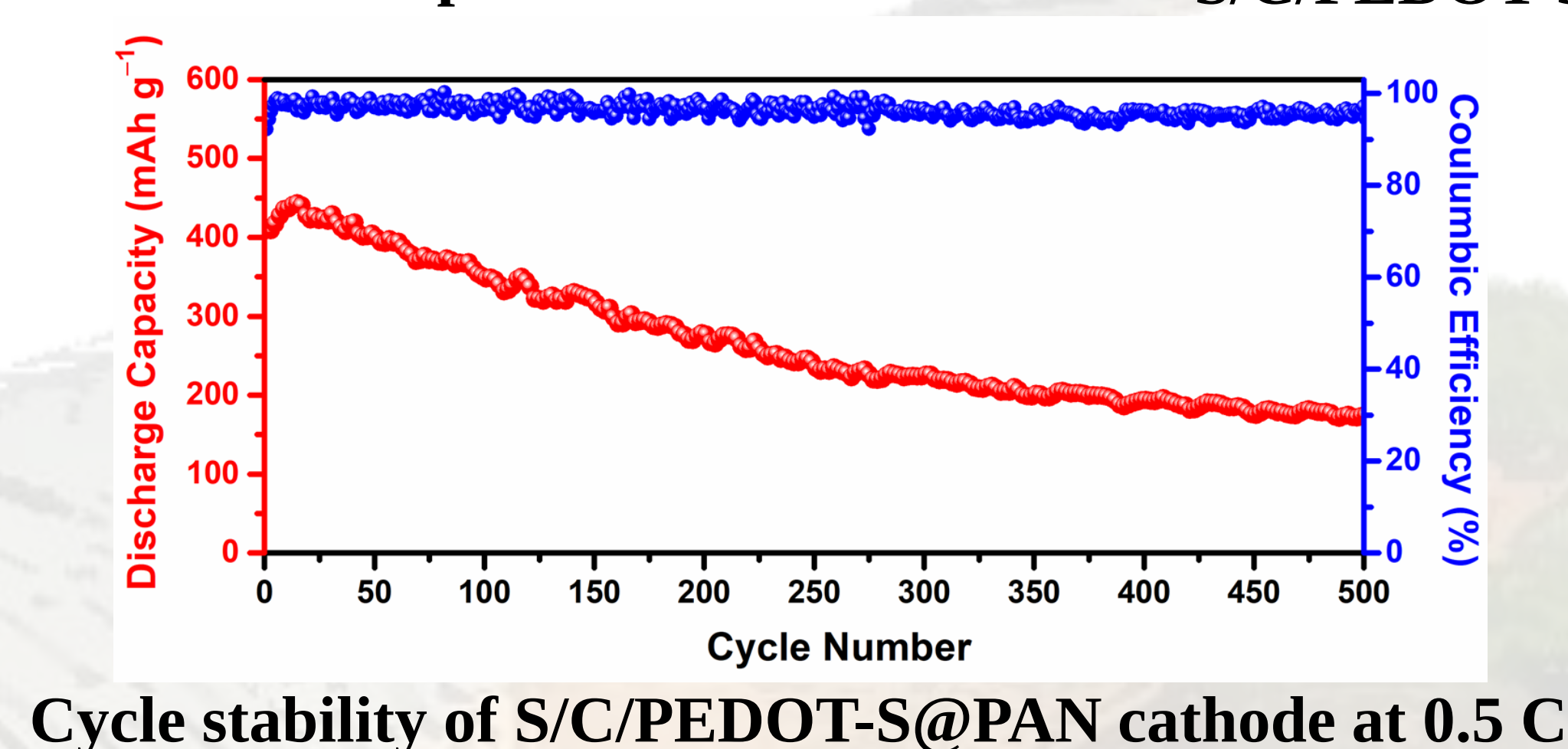


#### Cyclic Voltammetry Analysis



#### Electrochemical performance

FESEM images of S/C/PEDOT-S@PAN cathode



Cycle stability of S/C/PEDOT-S@PAN cathode at 0.5 C

### Industrial Significance

- A simple, economical and industrially scalable electrospinning process is adopted to develop flexible nanofiber additives, which could improve the performance of LSBs
- The concept of improving battery performance with incorporation of a small amount of additive could help the battery manufacturers to commercialize the high energy density LSBs technology

### Reference

1. Raulo, A.; Bandyopadhyay, S.; Ahamad, S.; Gupta, A.; Srivastava, R.; Formanek, P.; Nandan, B. Bio-Inspired Poly(3,4-Ethylenedioxythiophene): Poly(Styrene Sulfonate)-Sulfur@Polyacrylonitrile Electrospun Nanofibers for Lithium-Sulfur Batteries. J. Power Sources 2019, 431, 250–258.

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