Understanding and mitigating mechanical degradation in Li-S batteries: additive manufacturing (AM) of Li_2S composites and nanomechanical particle compressions

Saccone, M. A. & Greer, J. R. *J. Mater. Res.* 1–11 (2021). doi:10.1557/s43578-021-00182-w.

Scientific Achievement

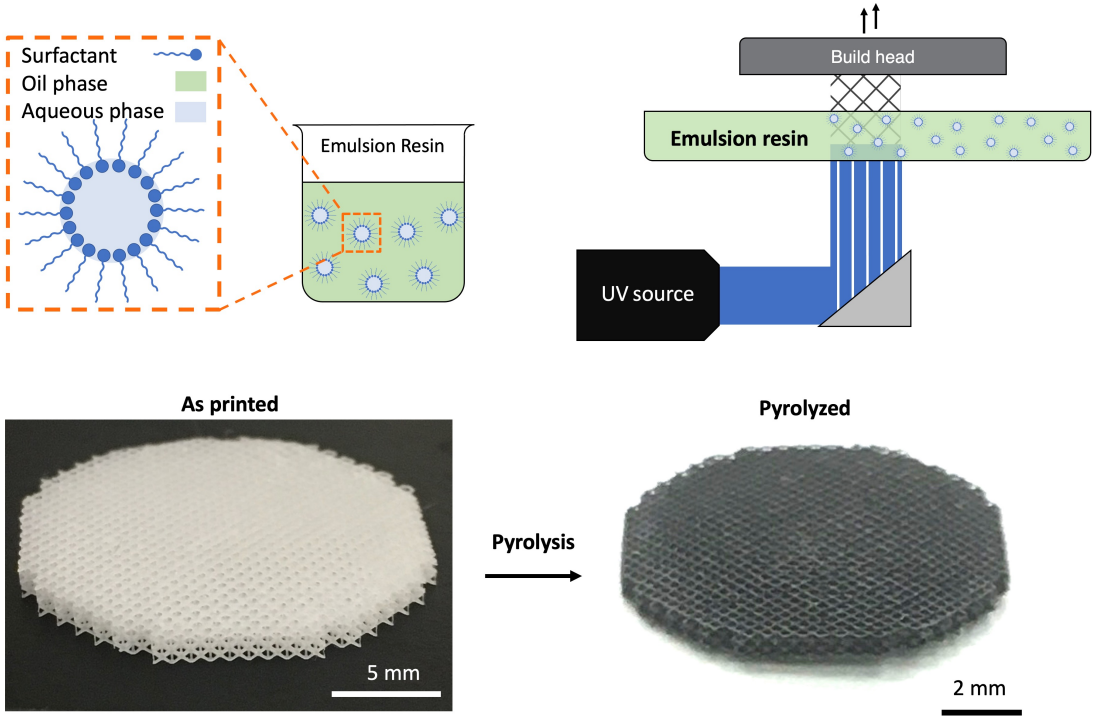
- We report a novel AM technique for air-sensitive Li-S cathode materials, and measure mechanical deformation of Li_2S particles

Significance and Impact

- Li-S batteries use earth-abundant materials, with great potential for grid storage applications
- This work aims to solve significant challenges with mechanical degradation and capacity fade

Technical Details

- Water-in-oil emulsion enables AM of air-sensitive composites
- 3x improved resolution over prior AM Li-S materials
- Li_2S particle compression reveals conditions for cracking



Schematic of novel emulsion stereolithography approach for fabricating lithium sulfide/carbon composite cathodes for Li-S batteries, with images of a 3D architected cathode as printed (polymer/Li_2SO_4 composite, left) and after pyrolysis (carbon/Li_2S composite, right).

Caltech | RESNICKINSTITUTE science + energy + sustainability