

Hybrid Polymer-Metal Oxide Composite Film Formation for 3D Printing

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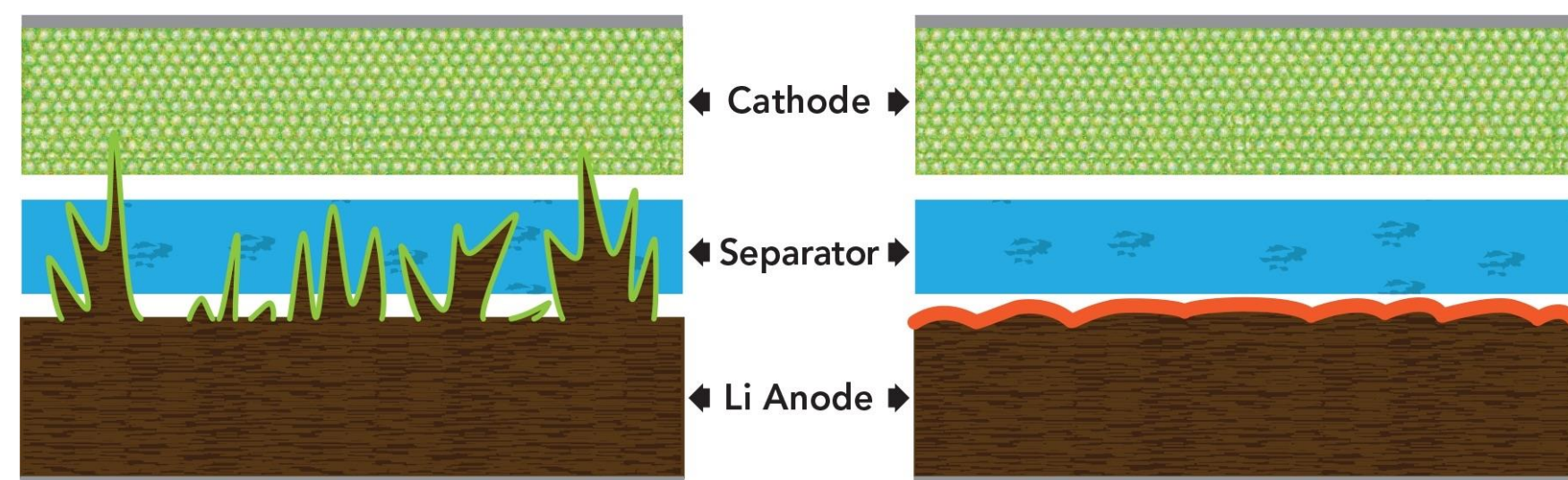


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Problem: Li-ion batteries are dense in energy but defects in separators can lead to shorts, then fires/explosions particularly from dendrites.

Goal: Synthesize ink to print bio-inspired films to attach to cathode side of battery separator, preventing dendritic growth.



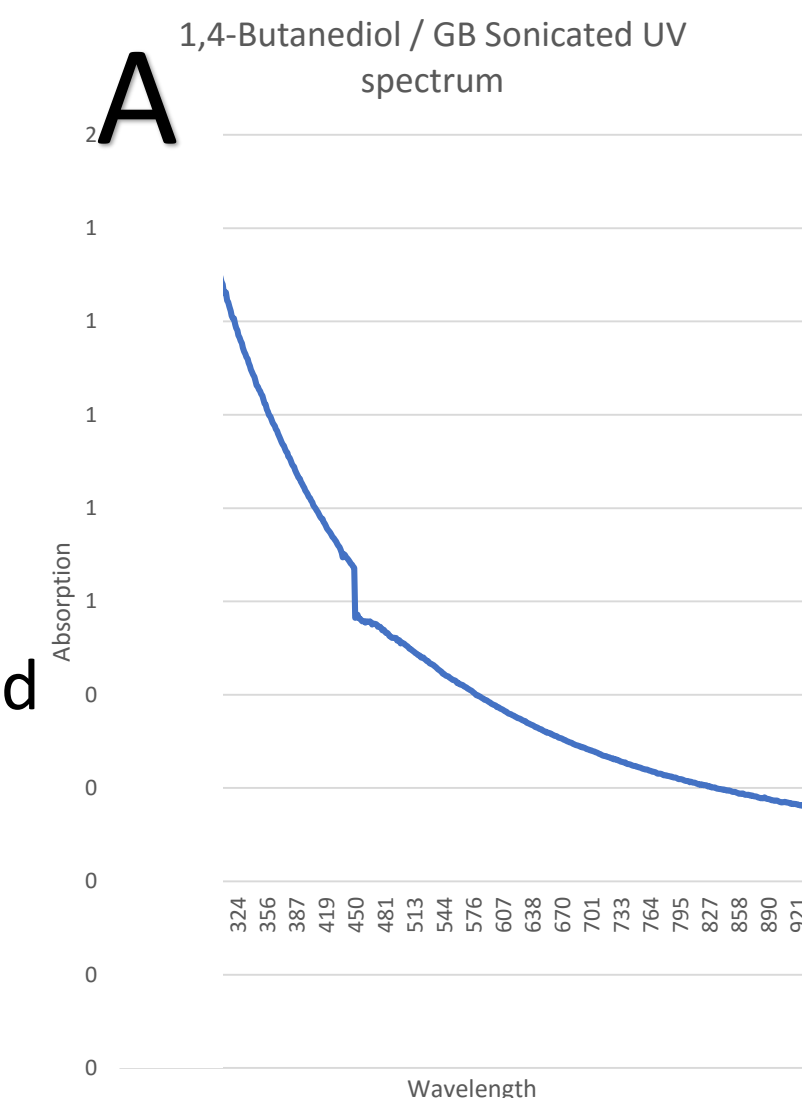
[W. Li, et al., Nature Communications, 17 June 2015 \(10.1038/ncomms8436\)](#)

Methods:

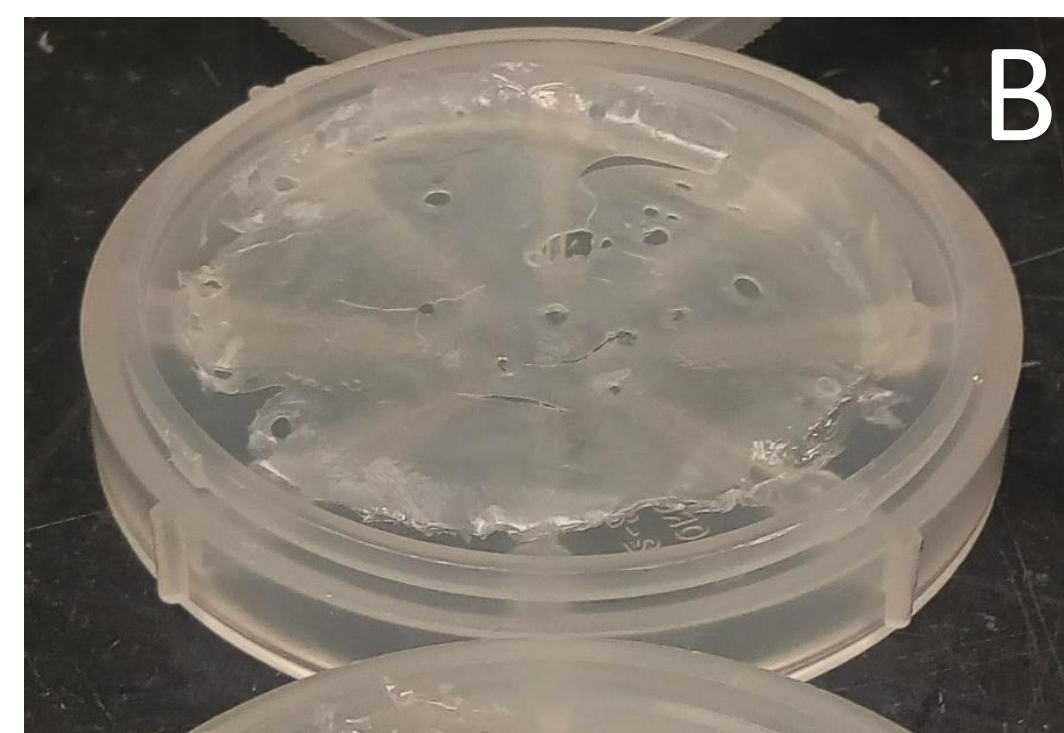
Solvent-based exfoliation of glyco-boehmite, with 1,4-butanediol provides well-dispersed particles as seen in (A). A sharp peak indicates this.

Polyester formation in ambient atmosphere.

FT-IR, TGA, particle-size, UV-VIS Spectrometry (A) used to characterize modifications to glyco-boehmite.



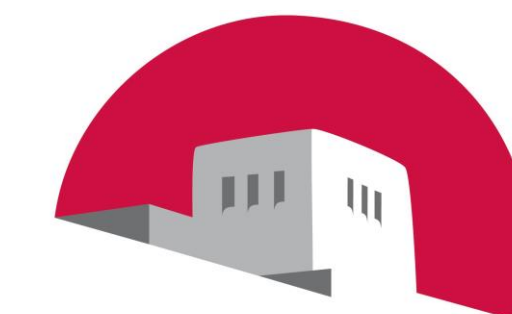
Results: When sonicated in 1,4-butanediol (shown to be intercalated in glyco-boehmite) and mixed with poly(acrylic acid), glyco-boehmite is shown to link together to form a somewhat uniform film(B). PAA will bubble without presence of toluene and water. Sheets agglomerate as shown (A) when



Future work:

Vary amounts of toluene, PAA, and compare results. Optimization must be carried out on current substance.

Develop method of printing.



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