

Recycling Diesel Combustion Byproducts as Conductive Additives in Lithium-ion Battery Cathodes

Cameron Ketelsleger [1], Darrell Gregory [1], Bertan Özdoğru [1], Sisi Yang [2], Stephen B. Cronin [2], Özgür Çapraz [1]

[1] The School of Chemical Engineering, Oklahoma State University, Stillwater, OK 74074

[2] University of Southern California, Los Angeles, CA 90089

Summary

- Lithium-ion batteries (LIBs) are the most widely commercialized rechargeable energy storage technology
- Super P Carbon is commonly used in LIBs as a conductive carbon
- Diesel soot particles are chemically similar to Super P carbon, so they have similar chemical properties
- Substitution of diesel soot for graphite may provide a clean and useful energy product from a toxic waste

Experimental Details

- 8:1:1:X weight ratio LFP:Conductive Carbon:CMC:Ultrapure Water
- Electrolyte: 1 M LiClO₄ in 1:1 EC:DMC
- Galvanostatic Charge/Discharge Tests
- Rate Capability Tests
- Material Characterization

Results and Discussion

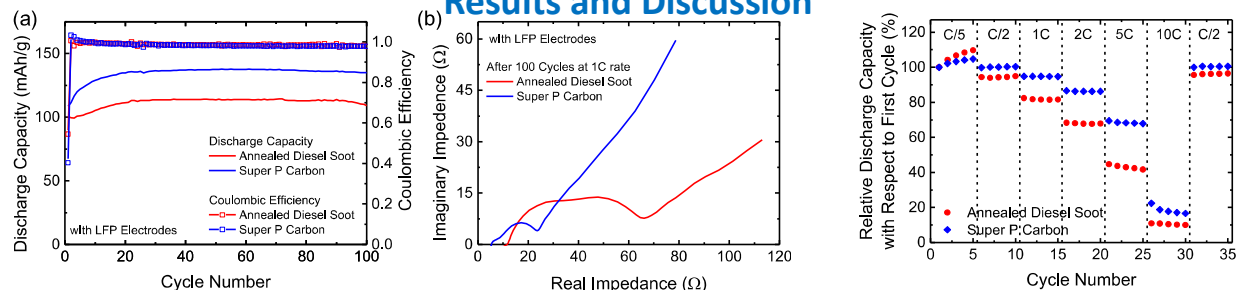
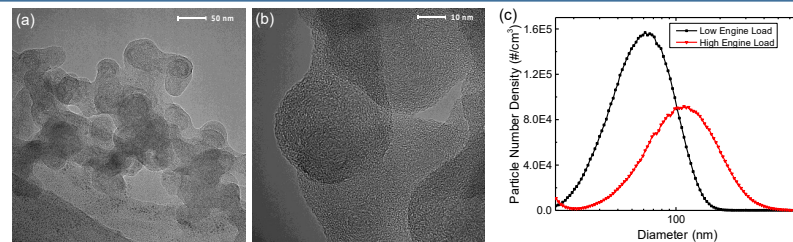


Figure 2(left): GCD tests of Super P vs. diesel soot. (middle) impedance spectroscopy. (right) rate capability testing.

Material Characterization

- Figure 3(left): High-resolution Transmission Electron Microscopy (HRTEM) images
- Figure 3(right): Scanning Mobility Particle Sizer (SMPS) spectroscopy



Battery Manufacturing

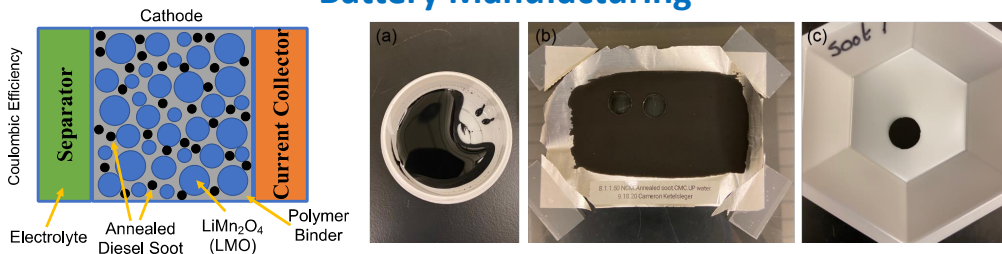


Figure 1: Slurry creation of diesel soot electrode to be used in coin cell construction.

Conclusions

- Diesel soot particles perform similarly to Super P carbon as conductive materials in LIBs
- There is industrial potential to use toxic waste as a useful conductive material

Future Studies

- Diesel soot used as electrode active material
- Diesel soot used as a conductive carbon in alternative batteries (e.g. sodium-ion batteries)

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