Aiming at zero-carbon emission in lithium-ion battery cathode production

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Introduction

Electric vehicles are considered carbon-free but battery production emits CO₂ extensively. CO₂ emission of battery production by components:

- Cathode: > 60%
- Others: > 197\(-93\%\)\(<40\) mAh/g

Methods

- Hydrogen fueled flame-assisted spray pyrolysis (FASP) for NCM811 cathode material
- Seamlessly incorporate lithium source addition alongside synthesis of Ni, Co, Mn framework within 30 seconds
- Calcination completed within 40 minutes at 850 °C

Results

- Battery capacity: 197.5 mAh/g, comparable to commercial counterpart 197.9 mAh/g
- Calcination only takes 40 minutes, 60 times faster than traditional coprecipitation
- Reduces the required calcination energy to 0.2 kWh/kg cathode, in contrast to coprecipitation 2.95 kWh/kg.

Conclusion & Outlook

- We proposed a fast synthesis method that reduces NCM811 material production to less than 1 hour.
- We believe FASP will lead to a cleaner, zero-carbon battery industry.
- CO₂ emission in calcination step decreases by 93%.

Acknowledgments

The author thanks MIT Deng Energy and Nanotechnology Group and support from Prof. Sili Deng, Dr. Jianan Zhang, and Maanasa Bhat.

Reference

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