Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18584

Thermodynamics of $Li_xNa_{1-x}CoO_2$ Layered Oxides - A Potential Lithium Saving Battery Cathode Material

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Critical metals are used widely within the renewable energy sector [1]. In particular cobalt compounds such as Co-based layered oxides have proven to be successful Li-ion battery cathode materials due to their high energy density and stability [1,2]. They are vital for rechargeable batteries [1], making them an important part of the renewable energy revolution. Rechargeable batteries have become indispensable for our modern day lives, yet they contain two different critical materials: cobalt and lithium [1,3,4]. We are investigating the thermodynamic stability of cathode materials in which a portion of the lithium content has been replaced with sodium ions. Thermodynamic data for this series of compounds via high temperature drop solution calorimetry will help to inform whether a portion of lithium in Li-ion battery cathode materials can be replaced with sodium without significant degradation of stability and battery performance. With this work we also investigate the solubility of sodium within the traditional lithium layered oxide using calorimetry, EDS, microprobe, TEM, and XRD. Preliminary data suggests homogeneity of the solid solution at sodium concentrations ~50% or greater. These compounds would allow us to extend our supply of lithium ensuring a sustainable future for lithium-ion batteries.

[1] Yoshino (2012) Angew. Chem. Int. Ed, 51 (24), 5798–5800.
[2] Mizushima, Jones, Wiseman, Goodenough (1980) Mater. Res. Bull. 15 (6), 783–789.
[3] Gunn (2014) John Wiley & Sons ; American Geophysical Union: *Critical Metals Handbook*
[4] Applegate, Mosley (2022) Notice 2022–04027; U.S. Geological Survey, Department of the Interior., pp 10381–10382.