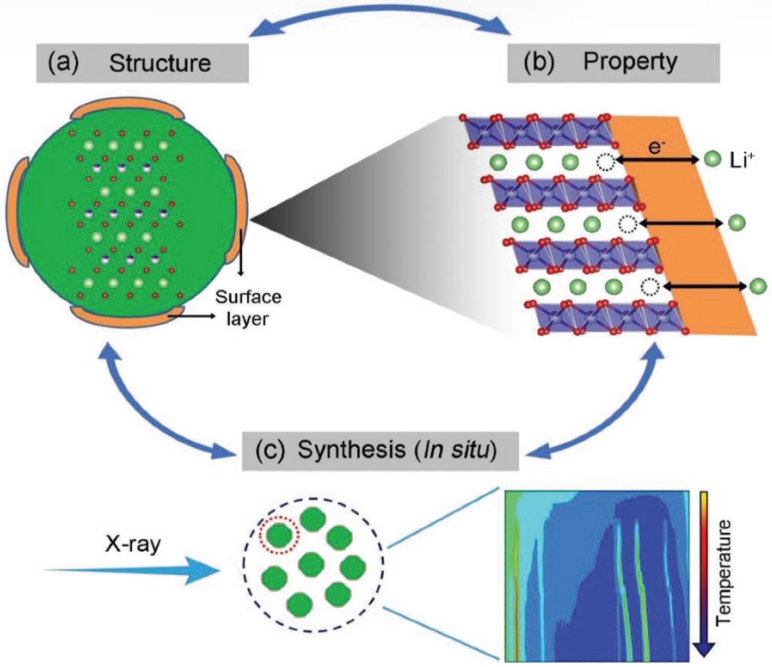
# Fast Cooldown for Making Battery Materials




*The "closed" loop approach for the rational design and synthesis of high-Ni layered oxides using multimodal x-ray studies to understand the property-structure connection.*

Zhang, M.-J., Hu, X., Li, M., Duan, Y., Yang, L., Yin, C., Ge, M., Xiao, X., Lee, W.-K., Ko, J. Y. P., Amine, K., Chen, Z., Zhu, Y., Dooryhee, E., Bai, J., Pan, F., Wang, F., *Adv. Energy Mater.* **9**, 1901915 (2019).

*Work was performed in part at Brookhaven National Laboratory*

## Scientific Achievement

**Scientists revealed how the cooling rate during synthesis impacts the chemical properties of high-nickel (high-Ni) layered oxides used as potential battery cathodes materials.**

## Significance and Impact

**Li-ion batteries (LIBs) are now increasingly used in electric vehicles, but a bottleneck for their mass adoption is low capacity; this study provides design guidance on synthesizing high-Ni layered cathodes.**

## Research Details

- A lithium nickel manganese cobalt oxide (NMC) battery cathode candidate was synthesized.
- These studies investigated the property-structure connection under different cooldown rates.
- They used in situ x-ray diffraction at the XPD beamline & x-ray imaging at the FXI beamline at NSLS-II.
- Results showed that fast cooling suppressed surface reconstruction, improving the performance.