Title of Submission

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This study presents a novel approach in the modeling of advanced cathode materials for lithium-ion batteries, aiming to enhance electrochemical performance and longevity. Utilizing a combination of atomistic and continuum modeling techniques, we investigate the impact of microstructural modifications on the electrochemical behavior of layered oxide cathodes. Our research identifies key parameters influencing ion diffusion and electronic conductivity, essential for optimizing battery design. The findings offer significant insights into developing more efficient and durable lithium-ion batteries, contributing to advancements in energy storage technologies as shown in Figure 1 below. This work demonstrates the potential of detailed material modeling in improving battery performance, providing a roadmap for future battery material innovations. [1] [2]

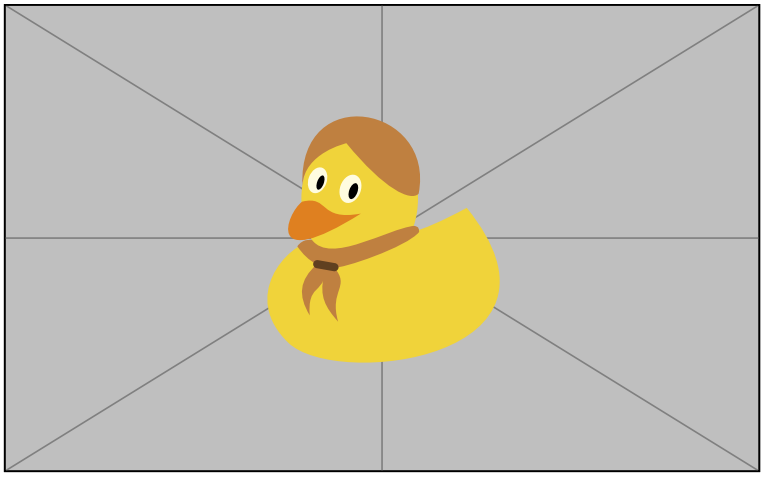

Figure 1: Caption

References

[1] Ragone, D. Review of Battery Systems for Electrically Powered Vehicles. *SAE Technical Paper Series*. (1968,2), http://dx.doi.org/10.4271/680453

[2] Newman, J. & Tiedemann, W. Porous-electrode theory with battery applications. *AIChE Journal*. **21**, 25-41 (1975,1), http://dx.doi.org/10.1002/aic.690210103