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Structural studies of halide-based superionic Lithium conductors

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The urgent need for sustainable energy solutions to address climate change and the increasing demand for high energy and power density have positioned solid-state batteries as a key area of research. Lithium metal chlorides (Li_3MCl_6) have emerged as promising candidates for next-generation batteries due to their high ionic conductivity, thermodynamic stability, and favorable mechanical properties. In this study, we investigated Li_3MCl_6 compounds with $\text{M} = \text{Dy}, \text{Ho}, \text{Tb}, \text{and Tm}$ through X-ray diffraction (XRD), confirming that all samples crystallize in the space group $\text{P}\bar{3}\text{m1}$, though exhibiting poor crystallinity and high disorder without post-synthesis annealing. Additionally, electrochemical impedance spectroscopy (EIS) was employed to evaluate their ionic conductivity, offering further insights into their potential for solid-state battery applications.

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