Compositionally complex perovskite oxides: Discovering a new class of solid electrolytes with interface-enabled conductivity improvements

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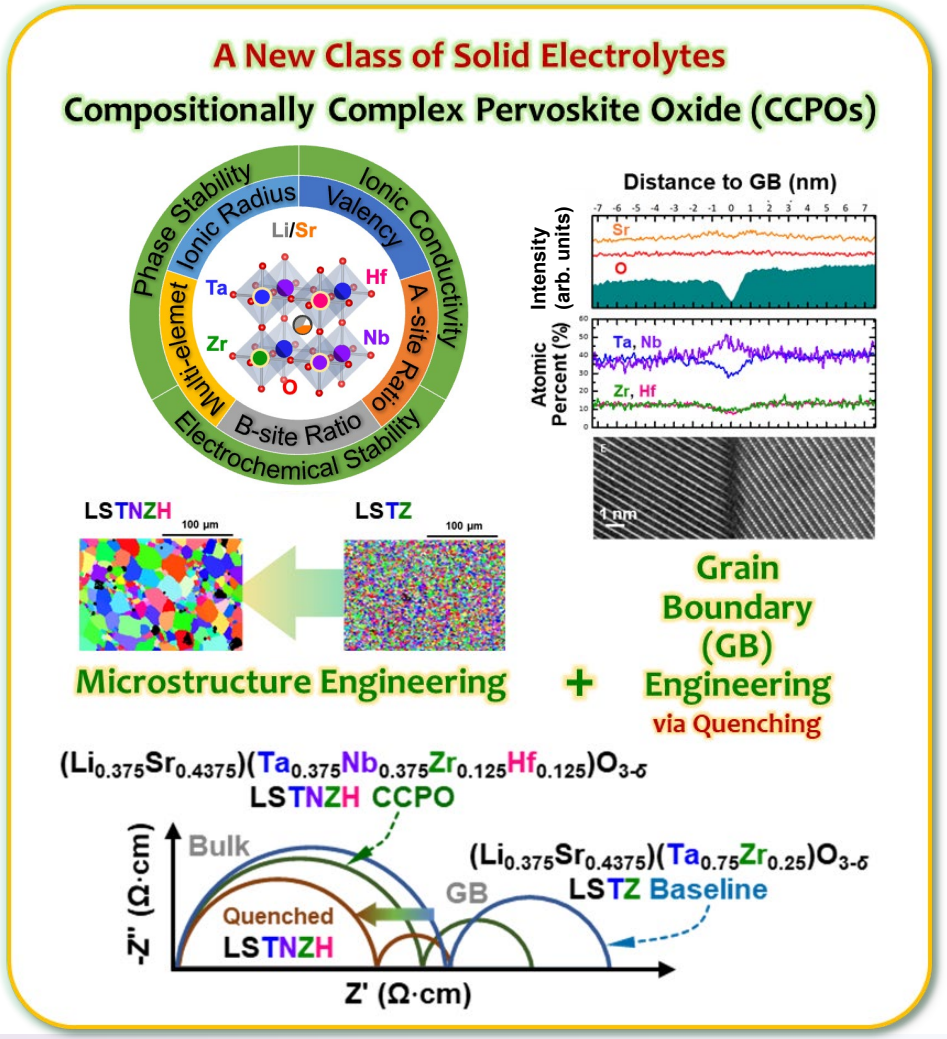
- In IRG-1, Luo and co-workers have discovered a new class of solid electrolytes: compositionally complex perovskite oxides (CCPOs).
- This collaborative study with Pan, Ong, Bowman, and MRSEC students further investigate the fundamental composition-processing-interface-microstructure-property relationship in these CCPOs.
- Specifically, $(Li_{0.375}Sr_{0.4375})(Ta_{0.375}Nb_{0.375}Zr_{0.125}Hf_{0.125})O_{3-\delta}$ (LSTNZH) CCPO has achieved >270% increase in the ionic conductivity in comparison with the state-of-art $(Li_{0.375}Sr_{0.4375})(Ta_{0.75}Zr_{0.25})O_{3-\delta}$ (LSTZ) baseline, while maintaining comparable electrochemical stability.
- Here, Luo and co-workers have established novel strategies of tailoring compositionally complex ceramics (CCCs) via (1) exploiting non-equimolar compositional designs and compositional complexity and (2) controlling microstructures and interfaces (grain boundaries).
- In a broader context, this work suggests transformative new methods to design and tailor CCCs, thereby opening a new window for discovering novel materials for energy storage and many other applications.



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