

### PVA/LLZTO based composite electrolyte with enhanced durability for all-solid-state lithium batteries

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In this study, polyvinyl alcohol/garnet-type  $\text{Li}_{6.4}\text{La}_3\text{Zr}_{1.4}\text{Ta}_{0.6}\text{O}_{12}$  (LLZTO) composite electrolytes containing 1-Butyl-3-methylimidazolium trifluoromethanesulfonate as the ionic liquid was synthesized using a solvent casting method as a type of ceramic-in-polymer system. LLZTO nanopowders act as an additive in a polymer matrix and improved the mechanical strength of the composite electrolyte as well as its cycling stability. Owing to the introduction of LLZTO nanopowder, the lithium ion conductivity of the composite electrolyte was increased to  $1.75 \times 10^{-4} \text{ S cm}^{-1}$  and the interfacial resistance between the composite electrolyte and a metallic lithium anode was decreased to  $414 \Omega \text{ cm}^2$  at RT. In addition, the tensile stress was enhanced to 2.57 MPa, showing promising candidate for application in all solid-state lithium battery system.