Supporting Information for:

Dense Freeze-cast $Li_7La_3Zr_2O_{12}$ Solid Electrolytes with Oriented Open Porosity and Contiguous Ceramic Scaffold

Authors

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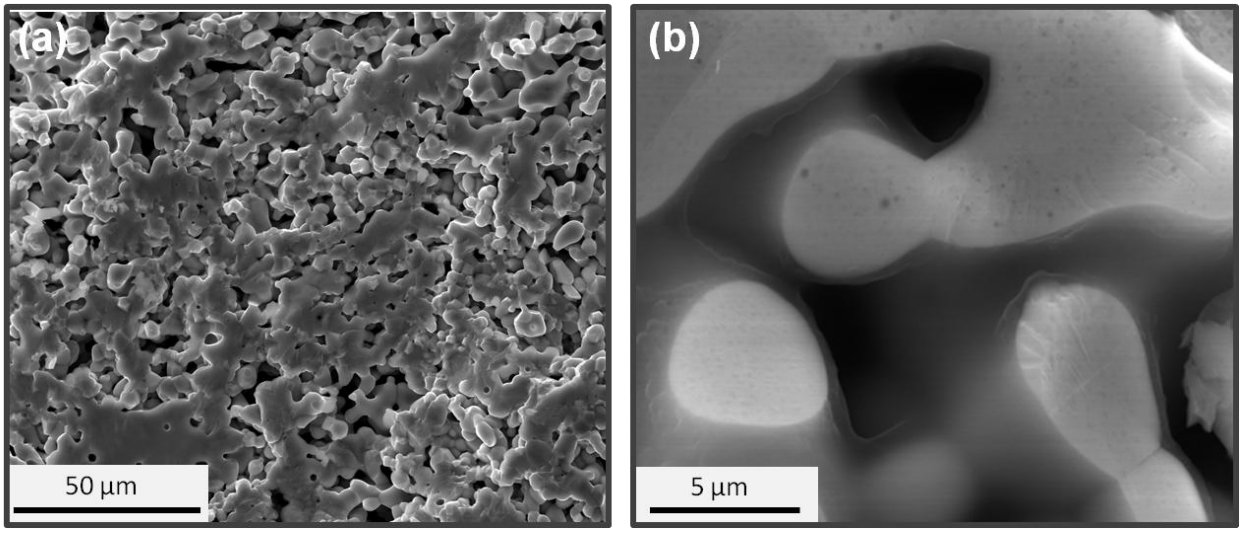
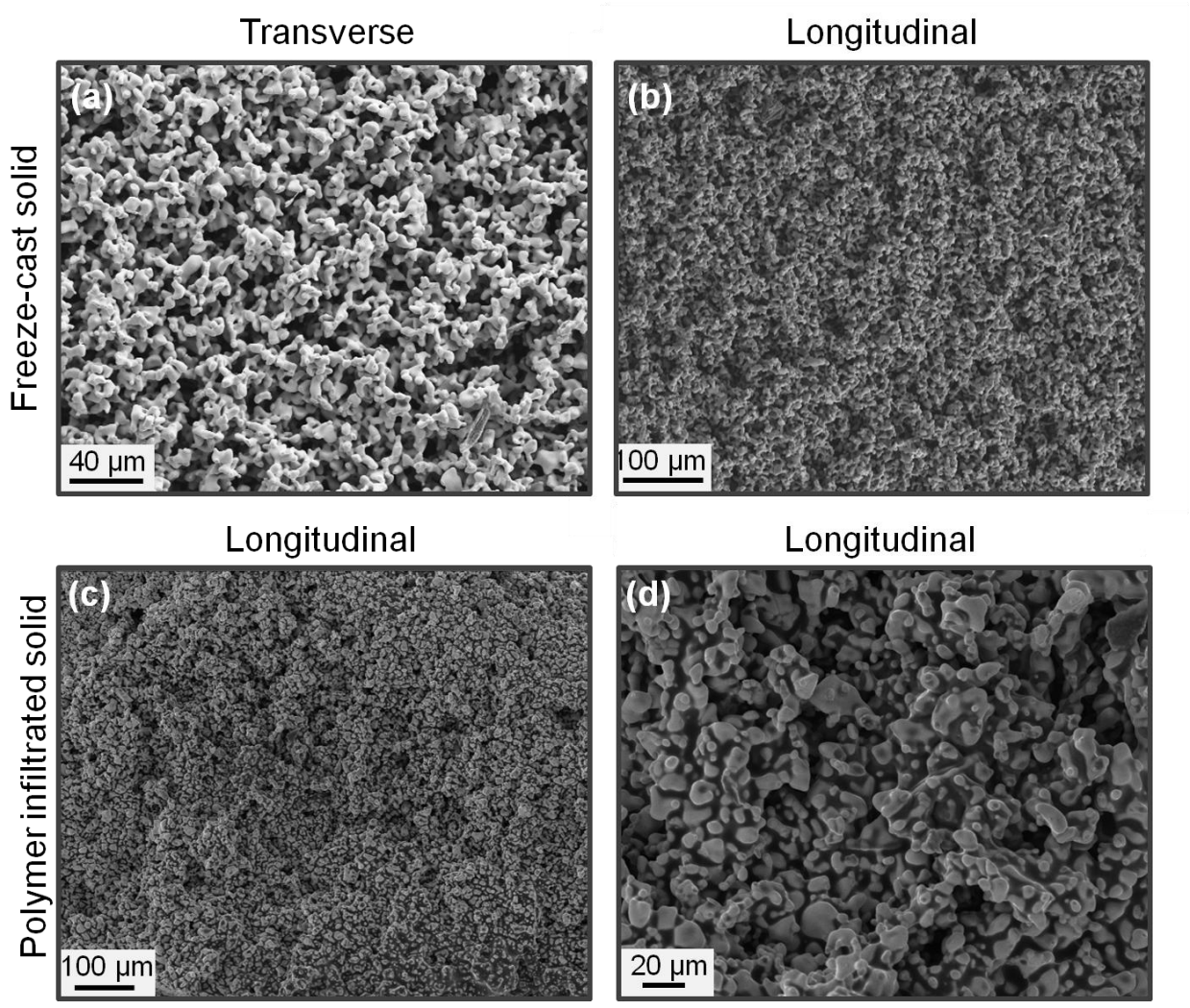
Additional experimental details

The polymer infiltration was performed by soaking the freeze-cast solids for 6 h in a solution containing 90.3 wt. % of polyethylene glycol (PEG) (MW = 300 $g \cdot mol^{-1}$, Sigma Aldrich), 9 wt. % of polyethylene glycol dimethacrylate (PEG-DMA) (MW = 1000 $g \cdot mol^{-1}$, Sigma Aldrich), 0.5 wt. % of 2,4,6-Trimethylbenzoyl-diphenylphosphine oxide (Sigma Aldrich) and 0.2 wt. % of 2,5-Bis(5-tert-butyl-benzoxazol-2-yl)thiophene (Sigma Aldrich). UV polymerization was performed overnight at λ = 405 nm.

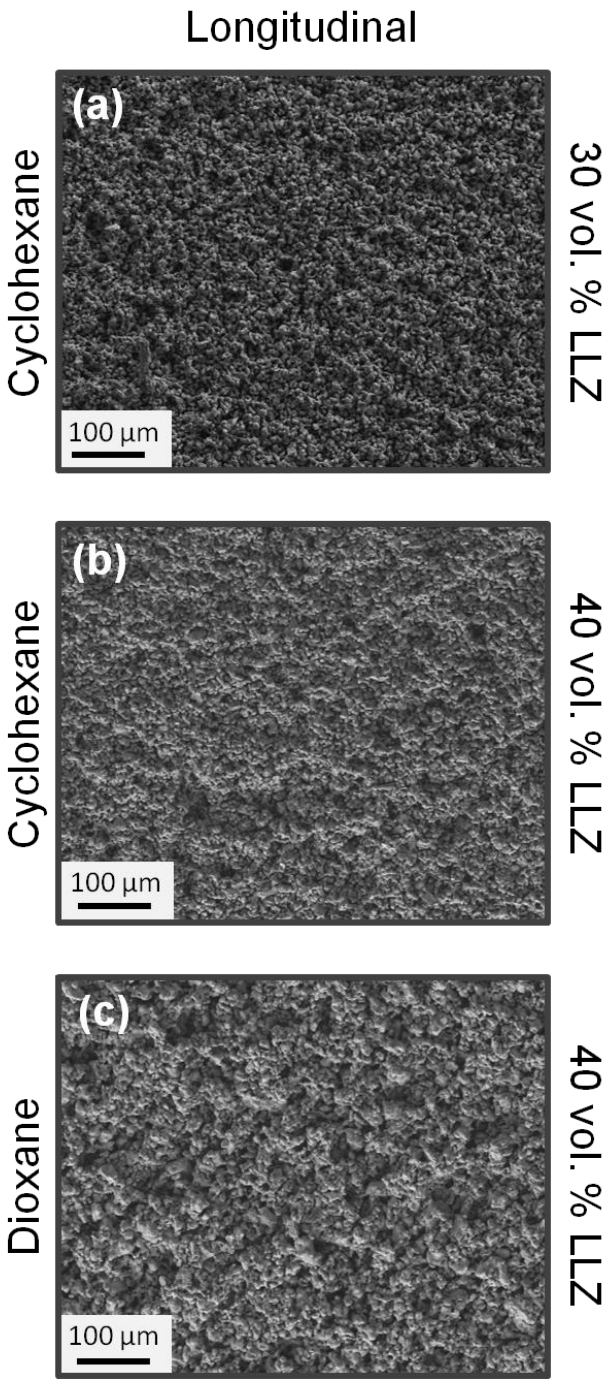
Supporting results



Supporting Figure S1. Cross section of a $Li_7La_3Zr_2O_{12}$ pellet prepared by conventional uniaxial pressing and sintering (a) after sintering at 1085°C for 12 hrs and (b) following infiltration by a PEG solution and UV polymerization. The polymer partially surrounds the dense ceramic framework but some pores with no polymer can still be observed



Supporting Figure S2. Porous network of a freeze-cast $Li_7La_3Zr_2O_{12}$ solid obtained by quenching of a cyclohexane-based slurry containing 20 vol. % of LLZ: (a) Transverse and (b) longitudinal cross sectional views. (c, d) Longitudinal views of a freeze-cast $Li_7La_3Zr_2O_{12}$ solid obtained by quenching of a cyclohexane-based slurry after polymer infiltration.



Supporting Figure S3. Porous network of a freeze-cast $Li_7La_3Zr_2O_{12}$ solid obtained by freezing slurries with (a) 30 vol. % and (b) 40 vol. % of LLZ in cyclohexane and (c) 40 vol. % of LLZ in dioxane. The slurries were cooled at a rate of $3°C \cdot min^{-1}$.