Designing Polymer Electrolytes for Next Generation Solid State Batteries

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ABSTRACT

The development of solid polymer electrolytes (SPEs) with high ionic conductivity hold the key for the realization of safe, long-lasting, high-energy batteries. Despite the considerable research effort in SPEs, the primary challenge that remains is the development of materials with a cation transference number close to unity and good mechanical properties without sacrificing ionic-conductivity. Here we introduce:

(i) single-component nanostructured materials where the entire single-ion SPEs will be created by the polyanionic nanoparticle as building blocks.
(ii) nanostructured solid polyanionic particles as additives to liquid, low molecular weight fast conducting single-ion polymer electrolytes.
(iii) Pre-shear history as a way to enhance the elastic modulus of SPEs, without affecting ionic conductivity by

The proposed macromolecular design approach and processing protocols offer new means to control the morphology of SI-SPEs and to decouple and tune the antagonistic properties of ion-conductivity and shear modulus, which currently limits the realization of single-ion polymer electrolytes in lithium metal batteries and beyond.

REFERENCES

If necessary, provide **up to 3** references in the format below: **font style Arial, font size "8".**

[1] Nikolakou G, Pantazidis C, Sakellariou G, and Glynos E. 2022. *Macromolecules,* **55**:6131 – 6139.
[2] Nikolakou G, Pantazidis C, Papadakis VM, Kenanakis G, Loppinet B, Sakellariou G, and Glynos E. 2022. *Macromolecules,* **55**:6131 – 6139.

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