TUNEABLE LI-ION BATTERY SEPARATORS USING UV-INDUCED POLYMERIZATION-INDUCED PHASE SEPARATION

Samuel Emilsson[1], Göran Lindbergh[2], Mats Johansson[1]

[1]Division of Coating Technology, KTH Royal Institute of Technology, Stockholm
[2]Division of Applied Electrochemistry, KTH Royal Institute of Technology, Stockholm

As we move to a carbon emissions-free society, batteries are becoming increasingly integral. An often-overlooked area of development within the battery research field is the separator. The current state-of-the-art in Li-ion batteries are polyolefin separators which are chemically inert and well proven at large production volumes. However, there is the potential to improve thermal and mechanical properties as well as enhancing dendrite suppression in new generation Lithium metal batteries.

Several approaches to develop advanced separators have been explored. For example, various coating techniques to enhance the properties of polyolefin separators have been developed. A variety of phase inversion and phase separation methods have also been demonstrated. [1] However, many of these procedures rely on several processing steps which increase the cost of the separator. An emerging alternative method is using polymerization-induced phase separation (PIPS), in which monomers are dissolved in porogenic solvents that phase separate upon UV-curing [2]. The result is a porous thermoset with both high mechanical and thermal stability. By varying the porogenic solvents and monomers, the microstructure is highly tuneable. In addition, the process is scalable, rapid, and energy efficient.

In this study, UV-initiated PIPS has been used to create mechanically robust separators using safe solvents. The structure-property relationship of the separators has been investigated, showing how different properties easily can be tuned. The cycling performance of the separators are also evaluated.

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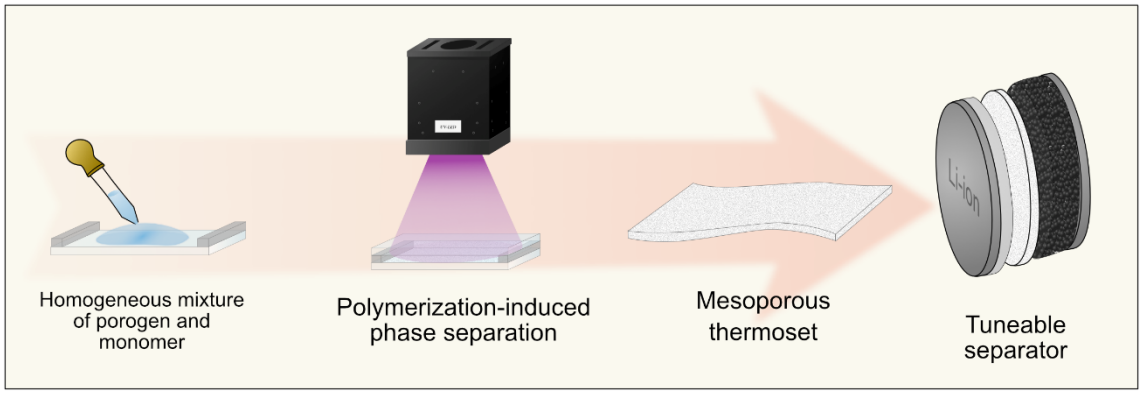

References

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