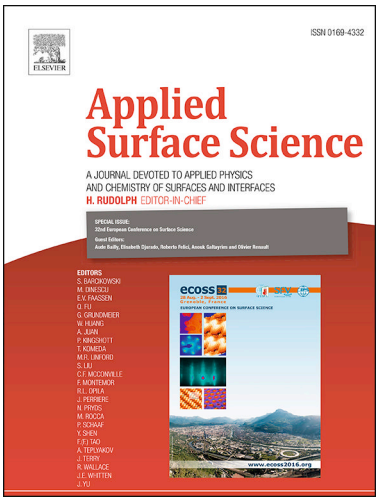

Full Length Article

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Facile synthesis of Li_2S-P_2S_5 glass-ceramics electrolyte with micron range particles for all-solid-state batteries via a low-temperature solution technique (LTST)

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Abstract

A lithium ion conductive $75Li_2S{\cdot}25P_2S_5$ glass-ceramics electrolyte is, for the first time, successfully synthesized via a new low-temperature solution technique (LTST) and compared to the conventional mechanical-milling technique. Both samples are composed of the highly lithium ion conductive thio-LISICON III analog phase. Due to the uniform dispersion of reactants in an organic liquid, the use of LTST produced significantly smaller and more uniform particle sizes (2.2 ± 1.68 μm) resulting in a 6.5 times higher specific surface area compared to the mechanically-milled sample. A pronounced enhancement of both the rate capability and cyclability is demonstrated for the LTST solid electrolyte sample due to the more intimate contact with the $LiCoO_2$ active material. Furthermore, the LTST sample shows excellent electrochemical stability throughout the potential range of -1 to 5 V. These results suggest that the proposed technique using the optimized LTST process is promising for the preparation of $75Li_2S{\cdot}25P_2S_5$ solid electrolytes for use in advanced Li-ion batteries.