ESM analysis on ion transport in composite electrodes for all-solid-state lithium ion batteries

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A disadvantage of solid electrolytes for solid state lithium ion batteries is their relatively low ionic conductivity. To improve this, it is necessary to study the electrochemical phenomenon occurring at the interface between the electrode and the solid electrolyte and the ion conduction mechanism therein. However, until now, researches have focused on macroscopic performance measurement in these mechanism studies, and there are few tools to observe interfaces and ion conduction channels in actual space and time. Here, an electrochemical strain microscopy (ESM) was used to visualize the ion conducting channel of the composite electrode surface and the interface between the active material and the solid electrolyte. We evaluated AFM image parameters associated with ESM measurements and suggested optimal conditions to identify ionic properties. The proposed method will contribute to the development of solid-state batteries by presenting the characteristics required for next-generation electrodes, and can be applied to other ion conduction systems in the field of electrochemistry.