

論文 / 著書情報
Article / Book Information

題目(和文)	リチウムイオン導電体Li ₁₀ + δ Ge ₁ + δ P ₂ - δ S ₁₂ 固溶体の合成：導電メカニズム及び全固体電池への応用
Title(English)	Synthesis of a solid solution for the lithium ion conductor, Li ₁₀ + δ Ge ₁ + δ P ₂ - δ S ₁₂ : its conduction mechanism and application to all-solid-state batteries
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論文要約

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論文題目	Synthesis of a solid solution for the lithium ion conductor, $\text{Li}_{10+\delta}\text{Ge}_{1+\delta}\text{P}_{2-\delta}\text{S}_{12}$: its conduction mechanism and application to all- solid-state batteries			

In chapter 1 「Introduction」, this chapter describes background of current research on all-solid-state lithium ion batteries. Well-known lithium superionic conductors and its structure were introduced, and currently proposed interfacial reaction mechanism was explained. Moreover, the purpose and originality of this research was described.

In chapter 2 「Experimental」, synthetic procedure of the $\text{Li}_{10+\delta}\text{Ge}_{1+\delta}\text{P}_{2-\delta}\text{S}_{12}$ (LGPS) and sol-gel solution was described. The measurement condition of X-ray diffraction, neutron diffraction and electrochemical measurement was explained in detail.

In chapter 3 「Synthesis, structure, and conduction mechanism of the lithium superionic conductor $\text{Li}_{10+\delta}\text{Ge}_{1+\delta}\text{P}_{2-\delta}\text{S}_{12}$ 」, this chapter describes existence of solid solution, conduction mechanism in $\text{Li}_{10+\delta}\text{Ge}_{1+\delta}\text{P}_{2-\delta}\text{S}_{12}$ structure.

In chapter 4 「Application of $\text{Li}_{10}\text{GeP}_2\text{S}_{12}$ solid electrolyte to all solid-state batteries with surface-modified LiCoO_2 cathodes」, this chapter describes interface modification and resistive layer formation mechanism between sulfide electrolyte and oxide electrodes to avoid unfavorable interfacial reactions between the oxide electrode and sulfide solid electrolyte, which interrupt all-solid-state battery from practical use.

In chapter 5 「General conclusions」, this chapter describes the summary of this research. A solid solution of $\text{Li}_{10}\text{GeP}_2\text{S}_{12}$ was confirmed, and highly disordered $\text{Li}_{10}\text{GeP}_2\text{S}_{12}$ structure at high temperature was identified by neutron structure analysis. The electrochemical property in all-solid-state batteries was mostly controlled by interfacial reaction between coating layer and sulfide electrolyte.