

Dual-Cation Borohydrides System as Solid-state Melt-Impregnable Electrolytes for Li-ion Batteries

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Abstract text

Complex borohydride becomes a type of promising solid-state electrolyte applied for rechargeable batteries¹. Although LiBH₄ can exhibit satisfactory Li-ion conductivity (10⁻³ S cm⁻¹) over 110 °C, while LiBH₄ only delivers 10⁻⁸ S cm⁻¹ at the room temperature, which extremely limits its practical application in all-solid-state batteries. And pervious reports normally focus on inorganic components, like metal oxide or halogen elements, to modify LiBH₄ to improve their conductivity. Herein, we combine LiBH₄ with borohydrides containing an organic cation, Me₄NBH₄, Et₄NBH₄ and nBu₄NBH₄ to synthesize a series of LiBH₄-R₄NBH₄ system. These obtained compounds exhibit great conductivity due to rotational motions of BH₄⁻ and disorder of R₄N⁺. The Me₄N(LiBH₄)₂ can deliver 4.46×10⁻⁵ S cm⁻¹ of Li-ion conductivity at 80°C with relatively lower activation energy 0.41 eV, it remained stable in the wide potential range from 0-3.5 V. These attempts not only pave a way for the design of new organic-borohydride systems but also achieve a potential and suitable solid electrolyte for Li-ion batteries.

References

- (1) Cuan, J.; Zhou, Y.; Zhou, T.; Ling, S.; Rui, K.; Guo, Z.; Liu, H.; Yu, X. Borohydride-Scaffolded Li/Na/Mg Fast Ionic Conductors for Promising Solid-State Electrolytes. *Advanced Materials* **2019**, *31* (1), 1803533. <https://doi.org/https://doi.org/10.1002/adma.201803533>.

Picture of Author



Short Biography of Author

2021-now: a PhD student in IMCN, UCLouvain, Belgium

- Supervised by Yaroslav Filinchuk. Focusing on designing new hydride solid electrolyte for rechargeable batteries (Li, Na, Mg, Al).

2018-2021: M.Sc. Hunan university, China

- Designed cathode electrode of potassium batteries with the aim to achieve high capacity and outstanding cycling performance; studied the formation of SEI layer using different electrolytes in potassium batteries.