**Supplementary information**

**Lithium ionic conduction in composites of Li(BH4)0.75I0.25 and amorphous 0.75Li2S·0.25P2S5 for battery applications**

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## Experimental

DSC/TGA thermal analysis was performed with a Netzsch STA 449 F3 Jupiter instrument in the 25–400 °C temperature range. Samples were measured with Al crucibles at a heating rate of 10°C min-1 and 50 mL min-1 Ar flow.



Figure S1. DSC analysis with simultaneous mass loss record for the LI/LPS system (α = 0.33).

Table ST 1. Experimentally observed and theoretically calculated (derived from the total energies) equilibrium lattice parameters (*a, b* and *c* in Å) for LiBH4 polymorphs.

|  |  |  |  |
| --- | --- | --- | --- |
| Compound | Space Group | Cell parameters in Å | |
| Experiment | Theory |
| LiBH4 | *Pmna(62)* | *a* = 7.1786a  *b* = 4.4369 a  *c* = 6.8032 a | *a* = 7.3635  *b* = 4.3982  *c* = 6.5965 |
| *P63mc(186)* | *a* = 4.2763 a  *c* = 6.9484 a | *a* = 4.1956  *c* = 6.8013 |

aFrom ref. (Soulié, J. P.; Renaudin, G.; Černý, R.; Yvon, K., *J. Alloys Compd.* **2002,** *346*, 200.)

Table ST 2. Calculated barrier height (in eV) for with and without different molecular species in LiBH4 phases.

|  |  |
| --- | --- |
| Phase | Barrier height (eV) |
| LT-LiBH4 | 0.69 |
| HT-LiBH4 | 0.53 |
| HT-LiBH4+LiI | 0.42-0.54 |
| HT-LiBH4+LiI+Li2S | 0.19-0.63 |