Magnesium solid electrolytes based on coordination complexes of magnesium borohydride

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We present unprecedented high Mg^{2+} conductivity in chelated Mg complexes of magnesium borohydride, $Mg(BH_4)_2$. The highest conductivity of $5*10^{-8}$ Scm^{-1} at 30 °C and $6*10^{-5}$ Scm^{-1} at 70 °C was found in the borohydride-ethylenediamine complex $Mg(en)_1(BH_4)_2$ as shown in figure 1. The coordination complexes are stable against elemental magnesium, support cycling in a potential window of 1.2 V, and allow reversible magnesium plating/stripping [1]. Our results demonstrate that partially chelated Mg^{2+} complexes represent a promising platform for the development of an all-solid-state magnesium battery.

Acknowledgement:
Financial support by the Swiss National Science Foundation by the Sinergia project "Novel ionic conductors" under the contract number CRSII2_160749/1 is gratefully acknowledged

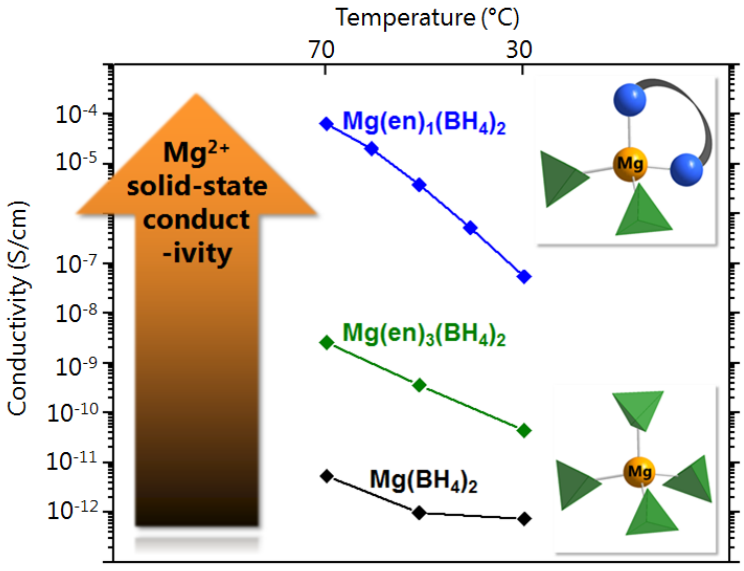

Figure 1
Mg ionic conductivities of $Mg(BH_4)_2$, $Mg(en)_3(BH_4)_2$ and $Mg(en_1)(BH_4)_2$

Reference

[1] Roedern, E.; Kühnel, R.-S.; Remhof, A; Battaglia, C. Magnesium Ethylenediamine Borohydride as Solid-State Electrolyte for Magnesium Batteries. *Sci. Rep.* **2017**, 7, 46189.