

IDENTIFICATION OF NEW Mg-B-N-H COMPOUNDS IN THE Mg(BH₄)₂-Mg(NH₂)₂ PHASES DIAGRAM

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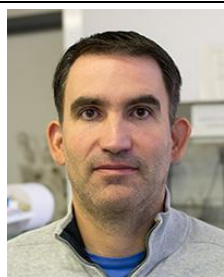
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In a similar manner as the exploration of the LiBH₄-LiNH₂ phases diagram revealing the existence of different Li-B-N-H phases able to release large amounts of hydrogen at moderated temperatures (>10 wt.% at 250°C for the Li₃BN₂H₈ composition), we have managed a similar study on the Mg(BH₄)₂-Mg(NH₂)₂ system. The only compound reported so far in the literature was MgBH₄NH₂, for which a notable Mg²⁺ ionic conductivity was measured (1x10⁻⁶ S/cm at 150°C), whereas Mg²⁺ conductivity in the solid state is usually very limited due to the strong polarising nature of the Mg²⁺ cation.

Our work was targeting a systematic exploration of the Mg(BH₄)₂-Mg(NH₂)₂ phases diagram. Three new compounds have been identified, labelled α, β and γ, respectively. The β phase with Mg₃B₂N₄H₁₆ composition is able to desorb 9.6 wt.% of hydrogen between 200 and 250°C, without significant NH₃ contamination. A new γ phase with Mg₃B₄N₂H₂₀ stoichiometry, thermally stable up to 250°C, shows a Mg²⁺ ionic conductivity of 4.1x10⁻⁵ S/cm at 100°C, making this compound one of the solid materials with the highest Mg²⁺ conductivity. During the talk, the possible use of these solid Mg²⁺ ionic conductors as solid electrolyte for Mg-ion batteries will be discussed.

References

- R. Le Ruyet, R. Berthelot, E. Salager, P. Florian, B. Fleutot, R. Janot, J. Phys. Chem. C 2019, 123, 10756.
R. Le Ruyet, B. Fleutot, R. Berthelot, Y. Benabed, G. Hautier, Y. Filinchuk, R. Janot, ACS Applied Energy Mater. 2020, 3, 6093.



Dr Raphaël JANOT (CNRS researcher since 2005) is a specialist in energy storage materials. His recent research activities were focused on various types of carbon used as anode materials in metal-ion batteries, and on complex hydrides for reversible hydrogen storage. He is the author of more than 60 peer-reviewed articles, 6 patents, 3 book chapters and has been an invited speaker to 12 international conferences.