

Electronic Supplementary Information

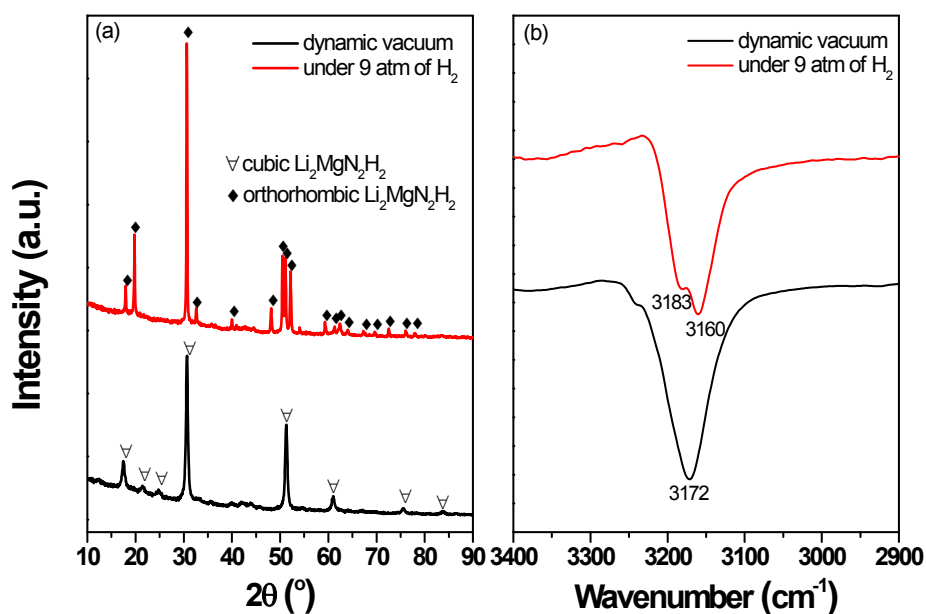
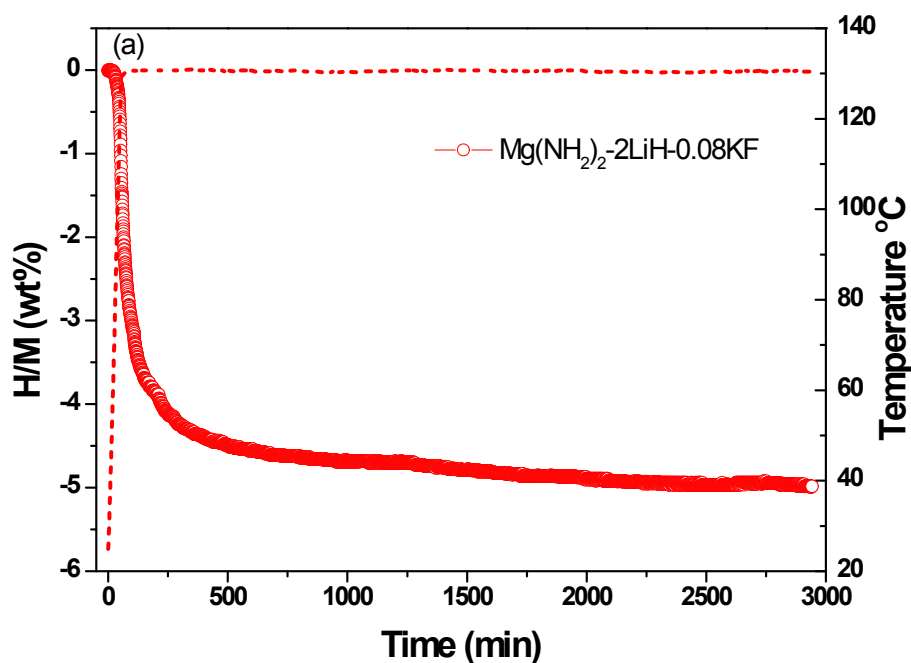


Fig. S1 XRD patterns (a) and FTIR spectra (b) of the dehydrogenated $Mg(NH_2)_2-2LiH$ under different conditions.



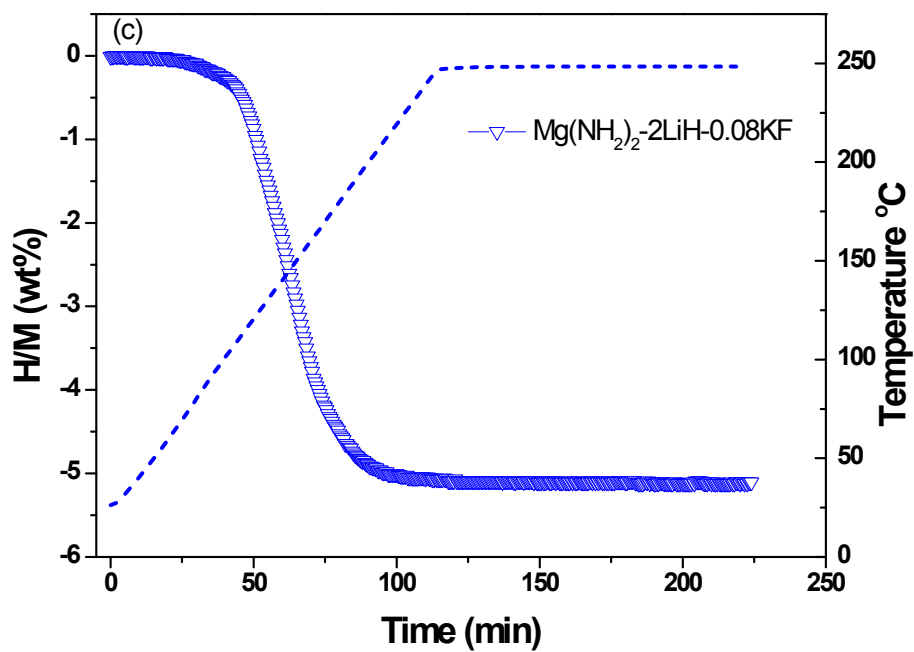
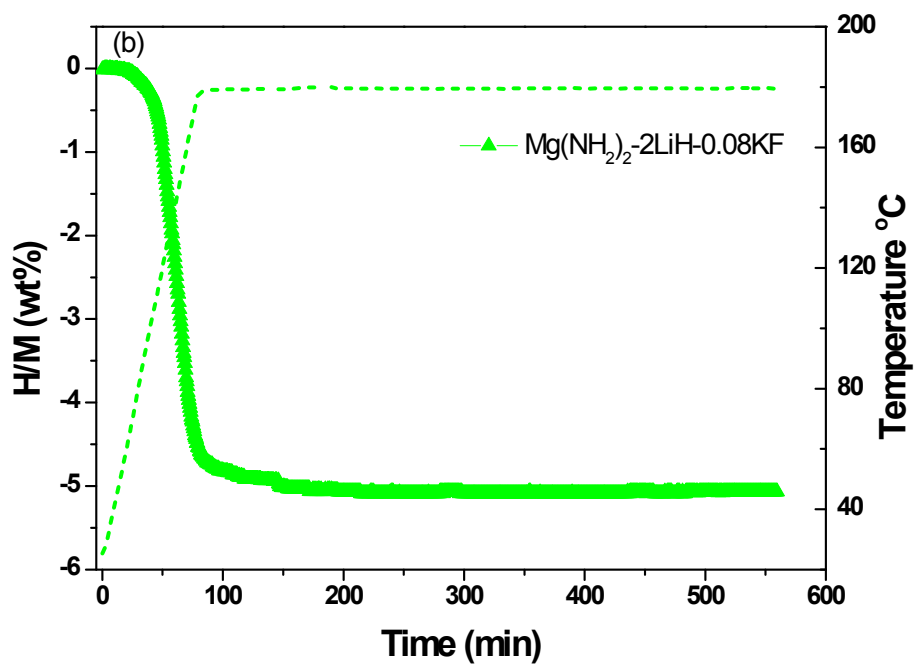


Fig. S2 Dehydrogenation curves of the $\text{Mg}(\text{NH}_2)_2\text{-}2\text{LiH}\text{-}0.08\text{KF}$ samples as a function of time and temperature.

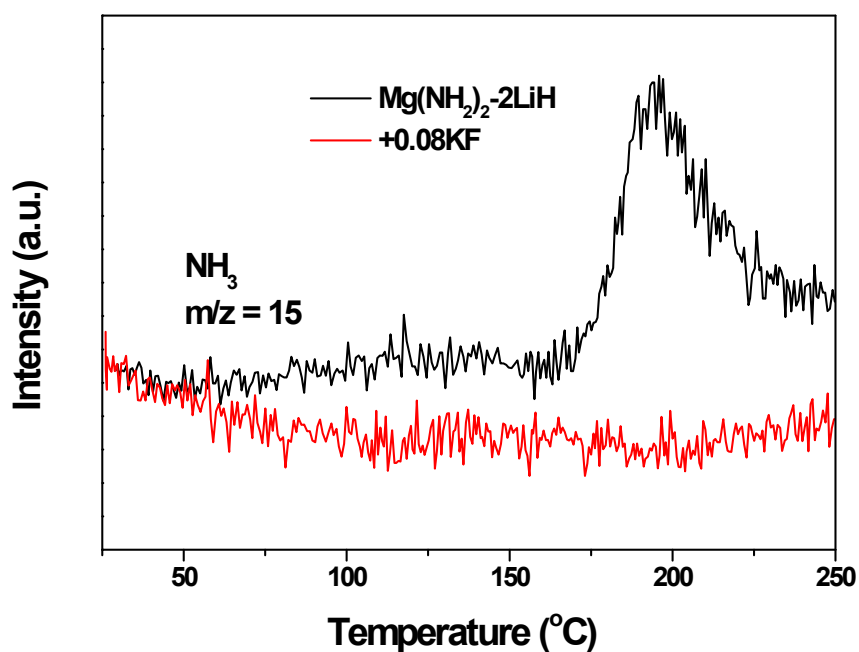


Fig. S3 MS- NH_3 of the $\text{Mg}(\text{NH}_2)_2\text{-2LiH}$ and $\text{Mg}(\text{NH}_2)_2\text{-2LiH-0.08KF}$ samples.

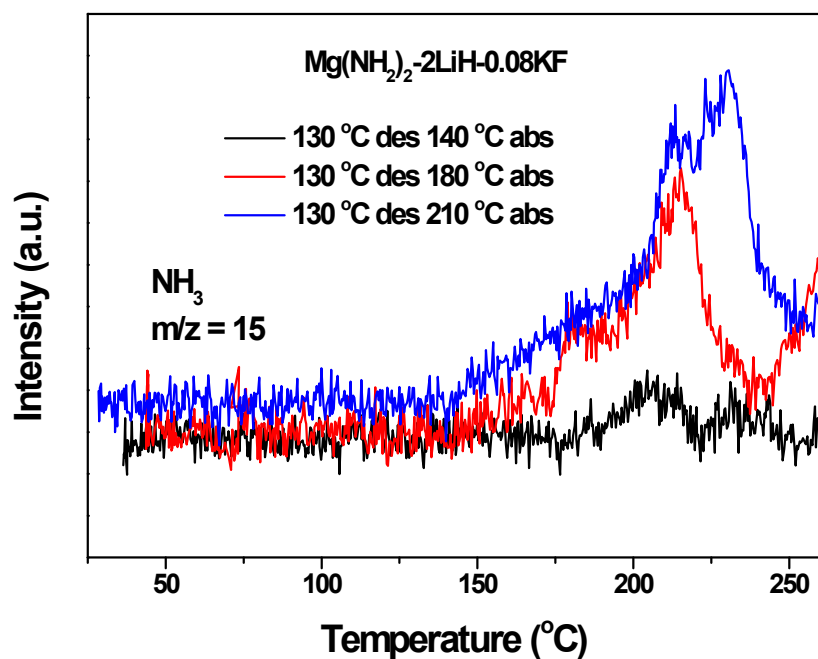


Fig. S4 MS- NH_3 of the $\text{Mg}(\text{NH}_2)_2\text{-2LiH-0.08KF}$ samples with different treatments.

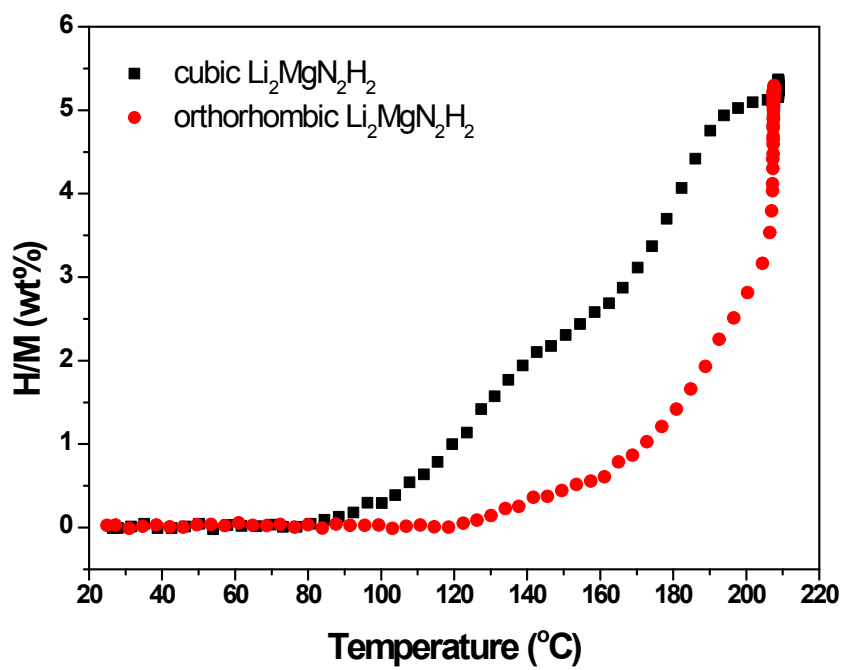


Fig. S5 Hydrogenation curves of the cubic and orthorhombic Li₂MgN₂H₂.

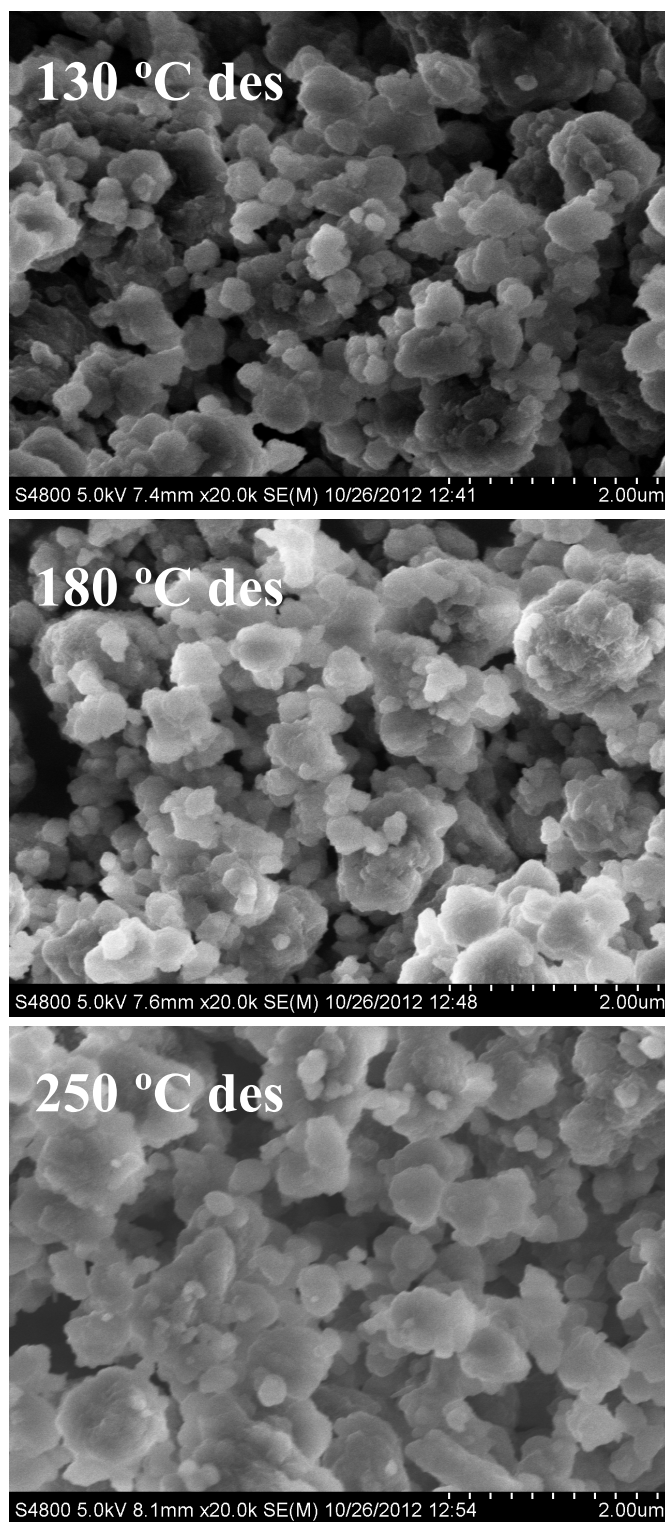


Fig. S6 SEM images of the Mg(NH₂)₂-2LiH-0.08KF samples dehydrogenated at different temperatures.

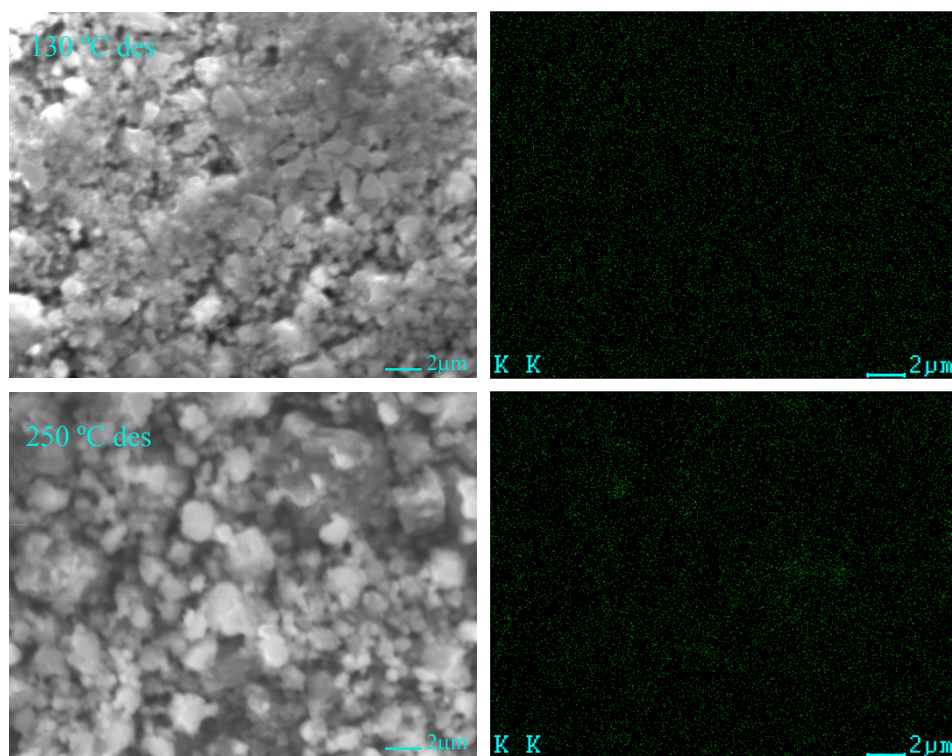


Fig. S7 SEM images and EDS mapping of K for the $\text{Mg}(\text{NH}_2)_2\text{-}2\text{LiH}\text{-}0.08\text{KF}$ samples dehydrogenated at 130 and 250 °C.

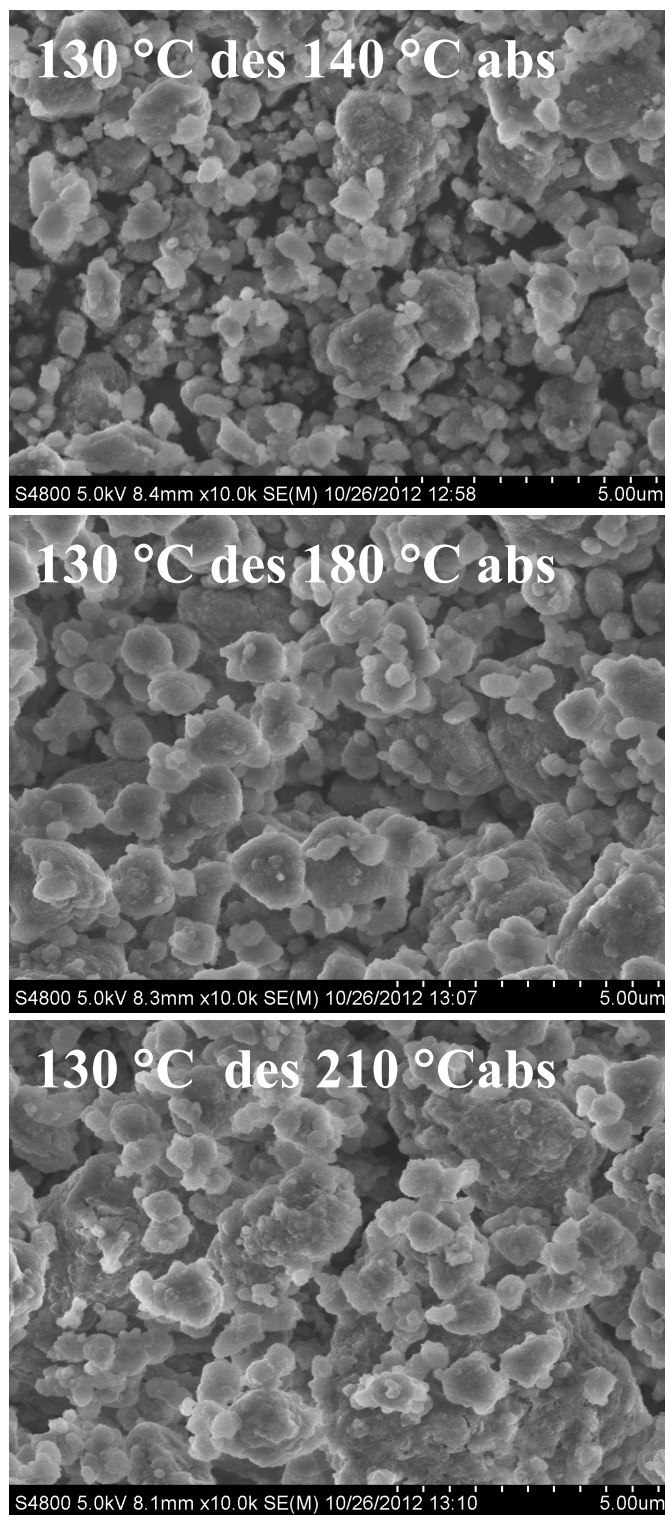


Fig. S8 SEM images of $\text{Mg}(\text{NH}_2)_2\text{-}2\text{LiH}\text{-}0.08\text{KF}$ hydrogenated at different temperatures.

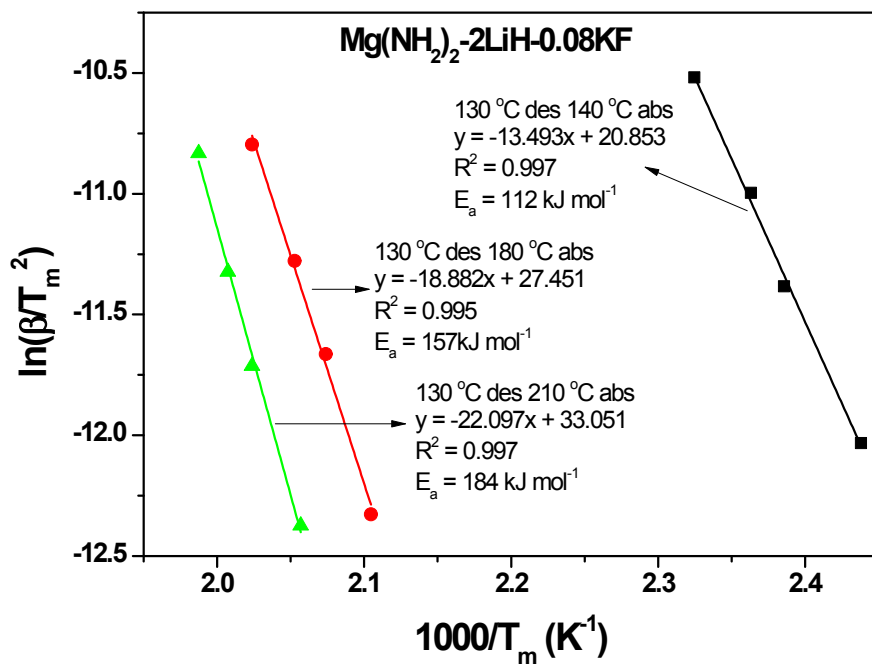
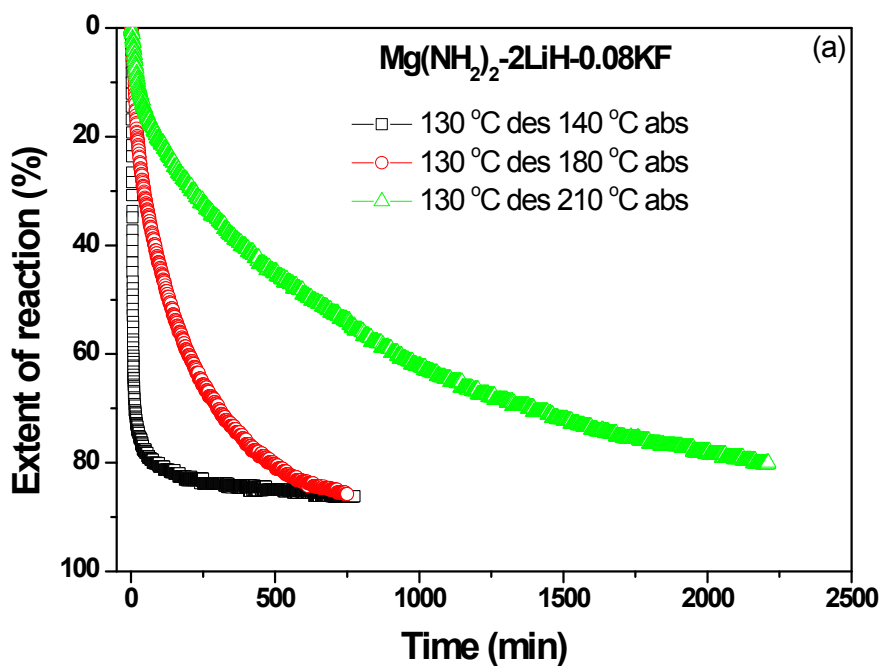


Fig. S9 Kissinger's plots of the Mg(NH₂)₂-2LiH-0.08KF samples.



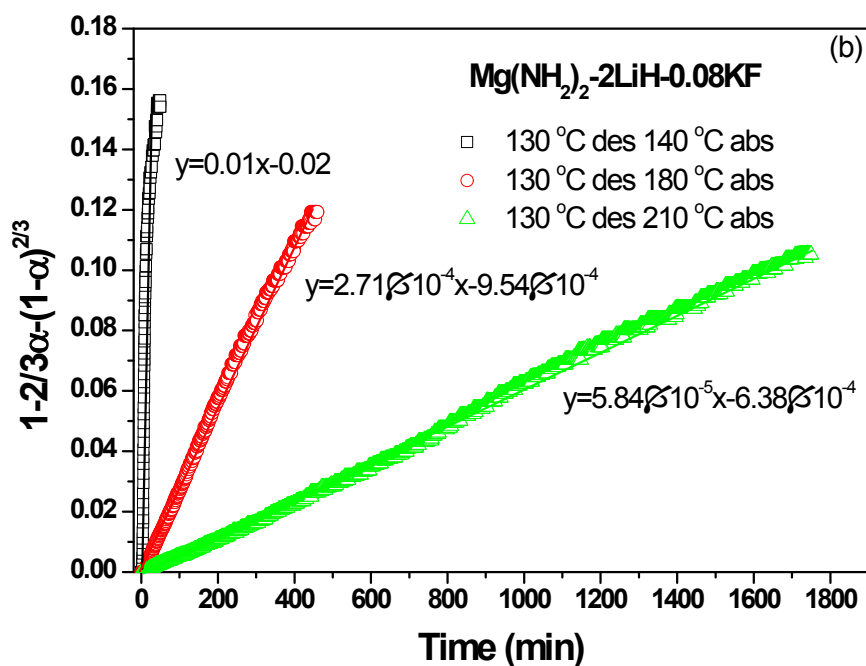


Fig. S10 Isothermal dehydrogenation curves (a) and the corresponding Ginstling-Brounshtein's plots (b) of the Mg(NH₂)₂-2LiH-0.08KF samples.

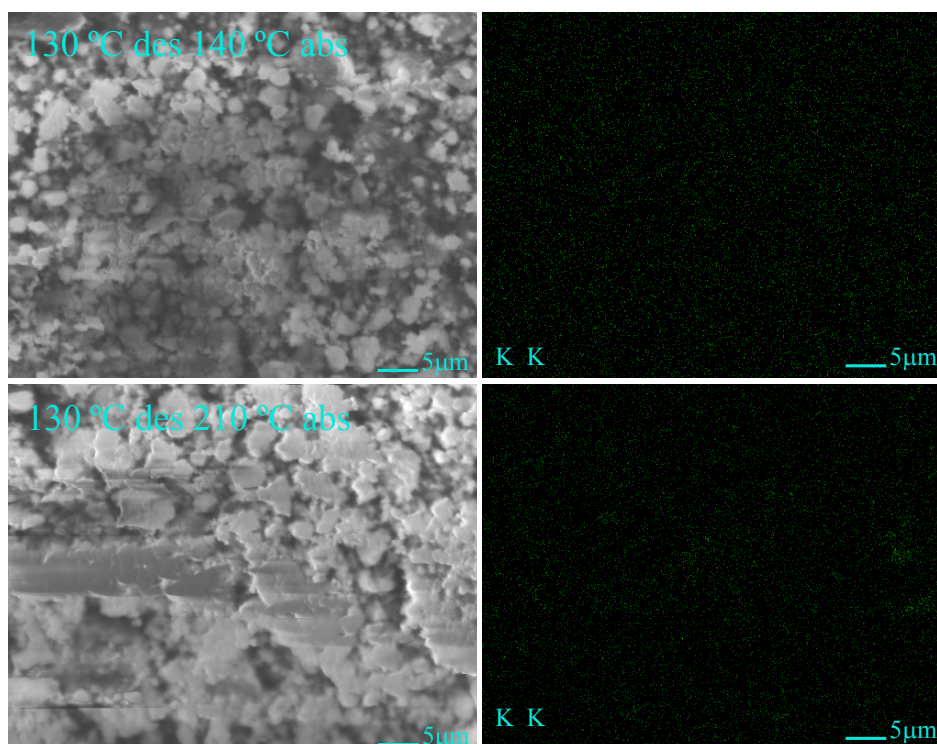


Fig. S11 SEM images and EDS mapping of K for the Mg(NH₂)₂-2LiH-0.08KF samples hydrogenated at 140 and 210 °C.

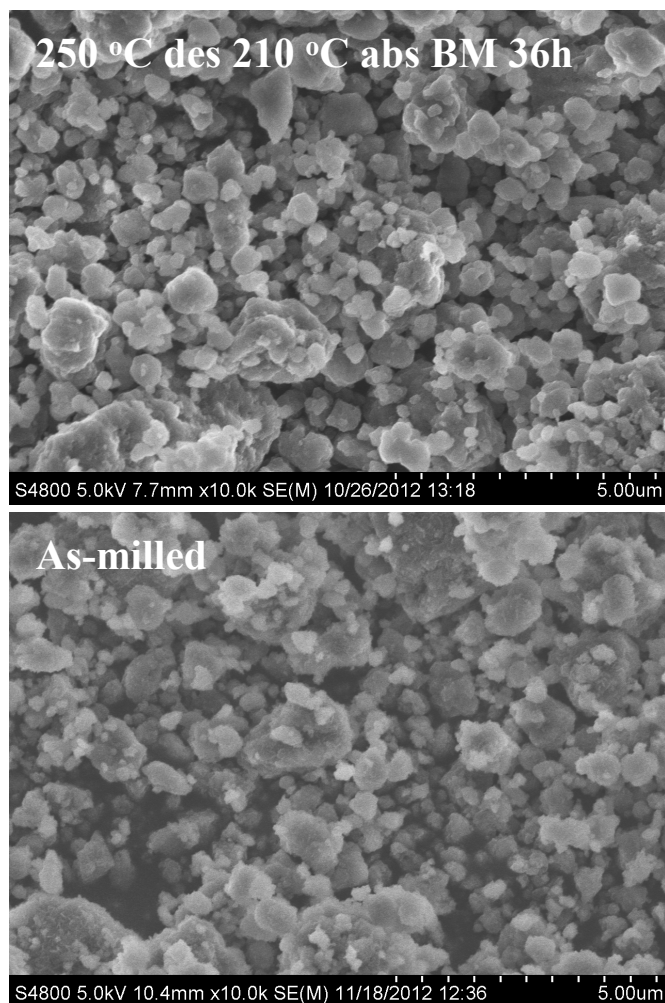


Fig. S12 SEM images of the post-milled $\text{Mg}(\text{NH}_2)_2\text{-}2\text{LiH}\text{-}0.08\text{KF}$ samples before and after cycling.