Supporting information

DSC technique was applied to collect the temperatures (T_p) at the maximum reaction rate at various heating rates (β = 1, 2, 3 and 4 K min^{-1}). Kissinger's method was adopted in determining the activation energy (E_a) and the pre-exponential factor (A):

$E_a = -R\ d(ln(\beta/T_p^2))/d(1/T_p)$

$A = \beta\ E_a\ exp(E_a/\ RT_p^2)/\ RT_p^2$

The reaction rate constant can be obtained by Arrhenius equation:
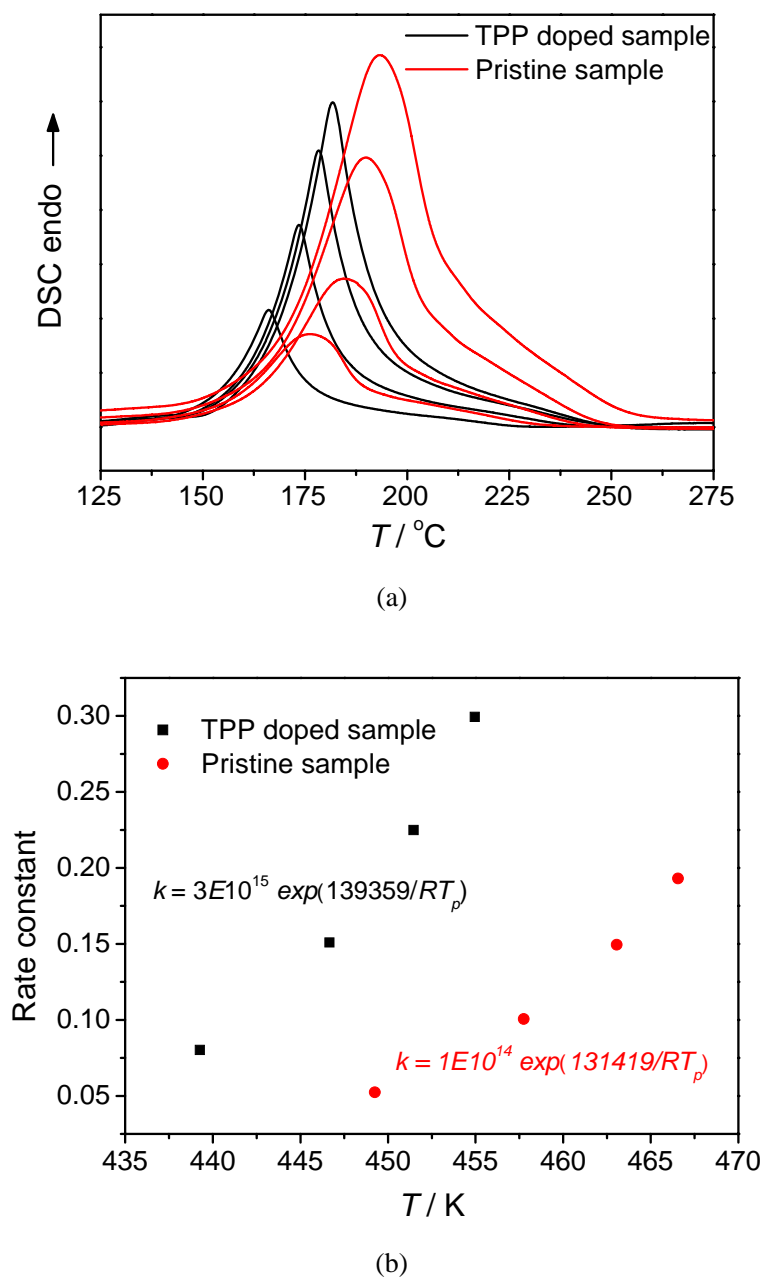
$K = A\ exp(E_a/\ RT_p)$

(a)

$k = 3E10^{15}\ exp(139359/RT_p)$

$k = 1E10^{14}\ exp(131419/RT_p)$

(b)

Fig. S1 (a) DSC curves of the TPP-doped and pristine 1Mg(NH$_2$)$_2$-2LiH sample measured at different heat rates: 1, 2, 3 and 4 K min^{-1}. (b) The reaction rate constants dependent of

temperatures for the TPP-doped sample and pristine sample. The rate constants of TPP-doped sample are almost three times the values of pristine sample in the testing temperature range.
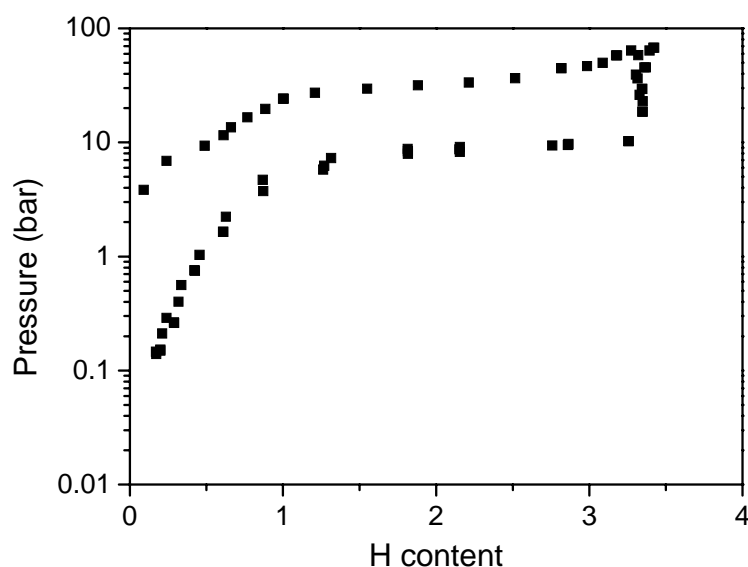

Fig. S2 Pressure-composition-temperature (PCT) isotherms of the TPP-doped $1Mg(NH_2)_2$-2LiH at 170 °C.
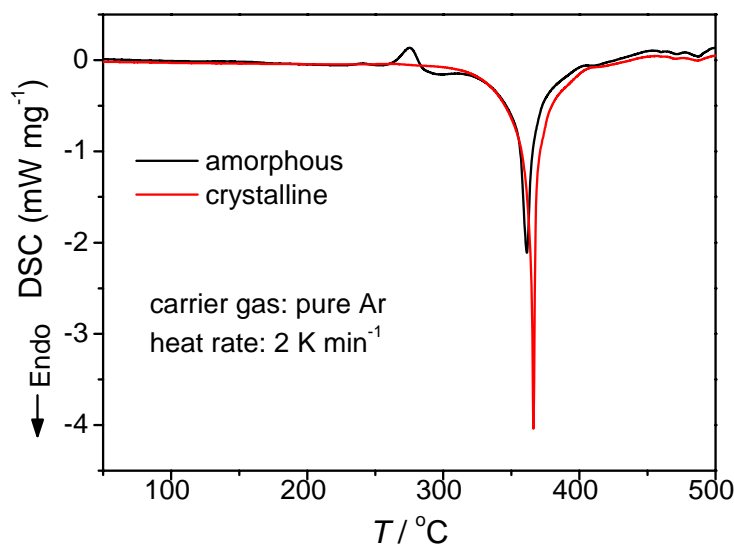

Fig. S3 DSC curves of amorphous and crystalline $Mg(NH_2)_2$. Amorphous $Mg(NH_2)_2$ was prepared by ball milling the crystalline $Mg(NH_2)_2$ for 36h. The exothermic peak around 275 °C should be ascribed to the amorphous-crystalline transition of $Mg(NH_2)_2$. But it's hard to get a precise value of heat of crystallization because this change somehow overlaps the decomposition of $Mg(NH_2)_2$.