Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information:

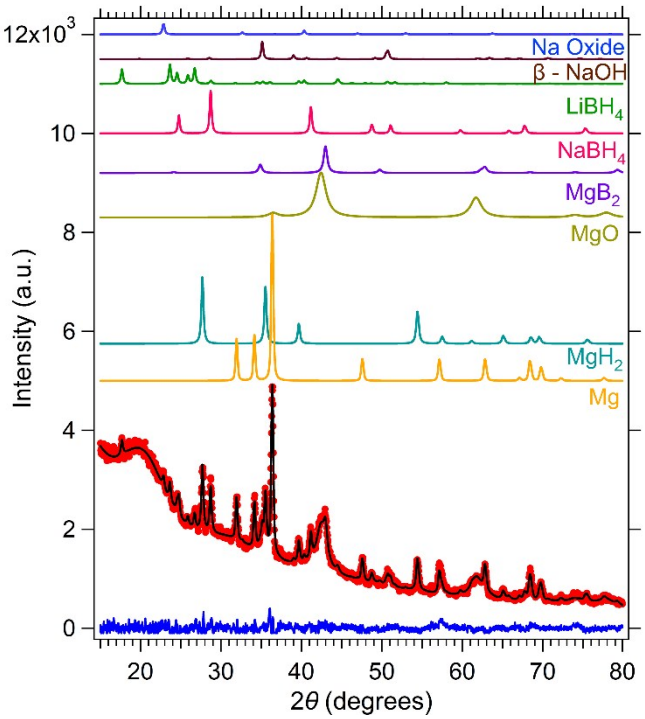

Fig. s1. Rietveld refinement plot of the crushed PMg33 sample. Experimental data shown with red circles, calculated diffraction pattern shown with black line and the difference plot shown in blue. The diffraction patterns of Mg, MgH_2, MgO, MgB_2, $NaBH_4$, $LiBH_4$, β-NaOH and Na oxide are represented with orange, teal, purple, pink, green, brown and blue colours respectively.

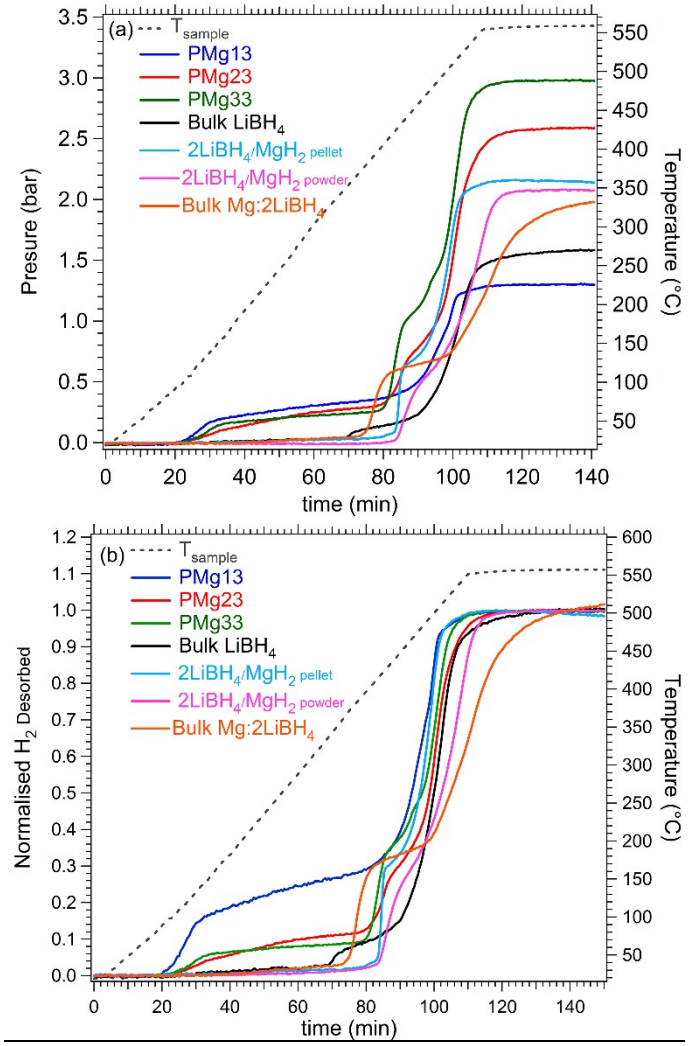

Fig. s2. Temperature programmed desorption results for PMg13, PMg23, PMg33, Bulk $LiBH_4$, bulk $2LiBH_4/MgH_2$ in a pellet form, bulk $2LiBH_4/MgH_2$ in a powder form and as prepared porous Mg pellet crushed and mixed with $LiBH_4$ with a $2LiBH_4/Mg$ molar ratio (a) desorbed hydrogen pressure versus time (b) normalised wt% of hydrogen desorbed versus time.

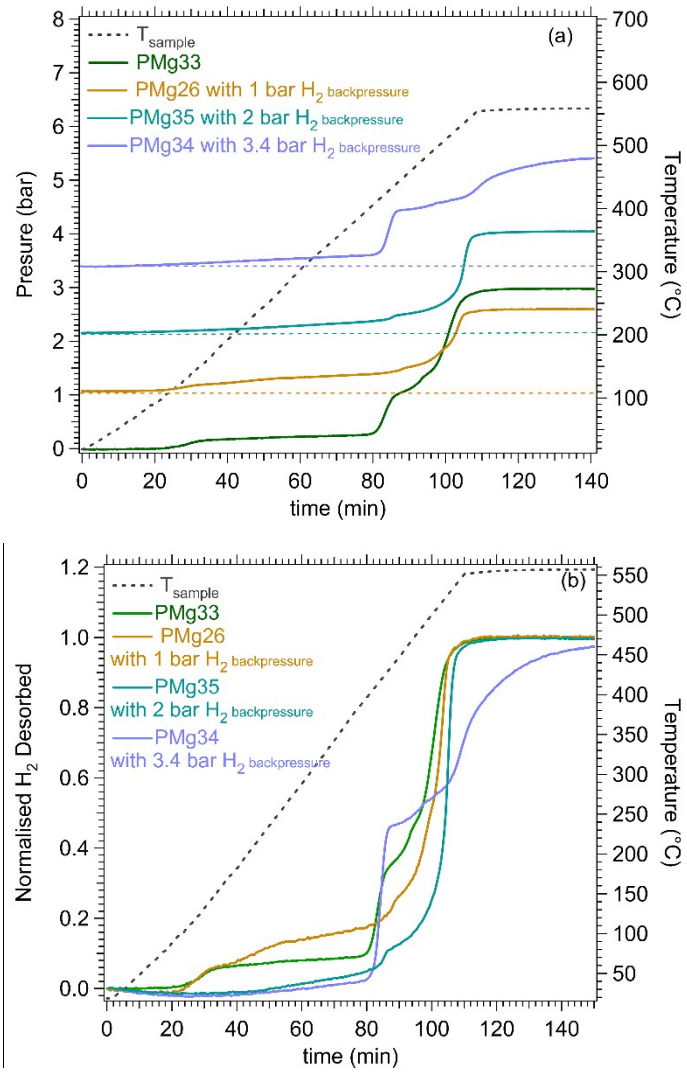

Fig. s3. Temperature programmed desorption results for PMg33, PMg26, PMg35 and PMg34 (a) desorbed hydrogen pressure versus time (b) normalised wt% of hydrogen desorbed versus temperature conducted under 0, 1, 2 and 3.4 bar of H_2 backpressure.

Table s1. Experimental (TPD) and theoretical quantity of desorbed H_2 from infiltrated $LiBH_4$.

Quantity of infiltrated $LiBH_4$ (wt%)	Max $T_{desorption}$ (°C)	Max $P_{observed}$ (bar)	Exp. H_2 wt%	Theor. H_2 wt% from eq (2)	Theor. H_2 wt% from eq (2&8)	Theor. H_2 wt% from eq (3)	Theor. H_2 wt% from eq (3&8)	Theor. H_2 wt% from eq (1)
12.78	543	1.43	2.81	2.37	2.96	-	-	-
22.50	558	2.70	5.09	4.16	5.21	-	-	-
26.13	556	2.73 (1 bar H_2 back pressure)	4.20	4.84	6.05	-	-	-
32.55	559	3.09	7.12	6.02	7.53	-	-	-
33.95	555	5.49 (3.4 bar H_2 back pressure)	3.10	6.28	7.85	-	-	-
35.05	559	4.05 (2 bar H_2 back pressure)	4.65	6.49	8.11	-	-	-
$2LiBH_4$:MgH_2 molar ratio pellet form	557	2.16	9.74	11.43	14.28	-	-	-
$2LiBH_4$:MgH_2 molar ratio powder form	558	2.08	9.69	11.43	14.28	-	-	-
$2LiBH_4$:Mg molar ratio (bulk)	558	2.04	4.81	-	-	8.57	11.69	-
100 (bulk)	557	1.73	12.11	-	-	-	-	13.8

$$2LiBH_4 \rightarrow 2LiH + 2B + 3H_2 \quad (1)$$

$$2LiBH_4 + MgH_2 \rightarrow 2LiBH_4 + Mg + H_2 \rightarrow 2LiH + MgB_2 + 4H_2 \quad (2)$$

$2LiBH_4 + Mg \rightarrow 2LiH + MgB_2 + 3H_2$ (3)

$LiH + Mg \rightarrow LiMg + 1/2H_2$ (8)