Supplementary Information:

Enhanced hydriding-dehydriding performance of $2LiBH_4$-MgH_2 composite by the catalytic effects of transition metal chlorides

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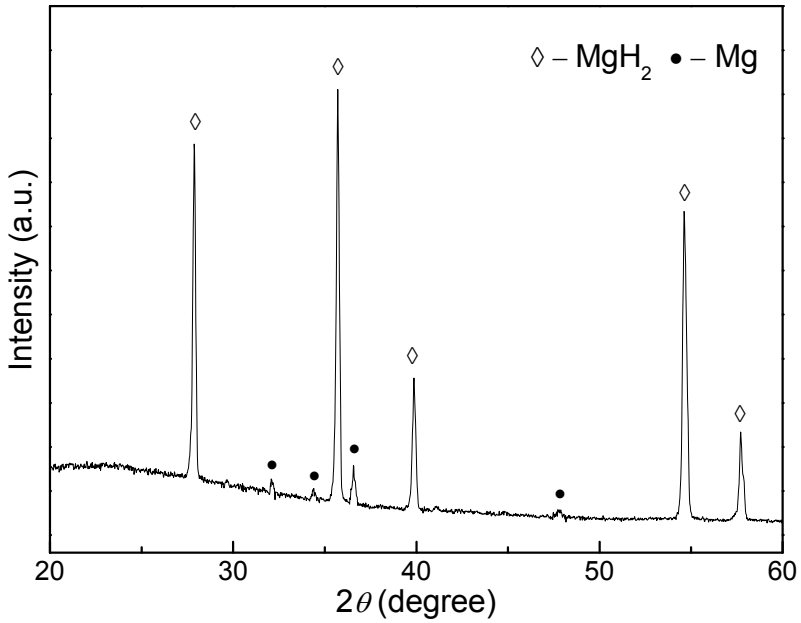

Figure S1. XRD pattern of the as-purchased MgH_2 from Alfa Aesar.

Table S1. Peak Temperatures for Each Sample in DSC Profiles.

Peak / °C / Sample	A	B	C	D
undoped	116.5	293.1	371.5	448.3
$2LiBH_4$-MgH_2-0.1$FeCl_2$	103.4	291.9	330.5	434.9
$2LiBH_4$-MgH_2-0.1$CoCl_2$	104.2	287.7	311.2	427.6
$2LiBH_4$-MgH_2-0.1$NiCl_2$	104.9	286.1	297.5	408.4

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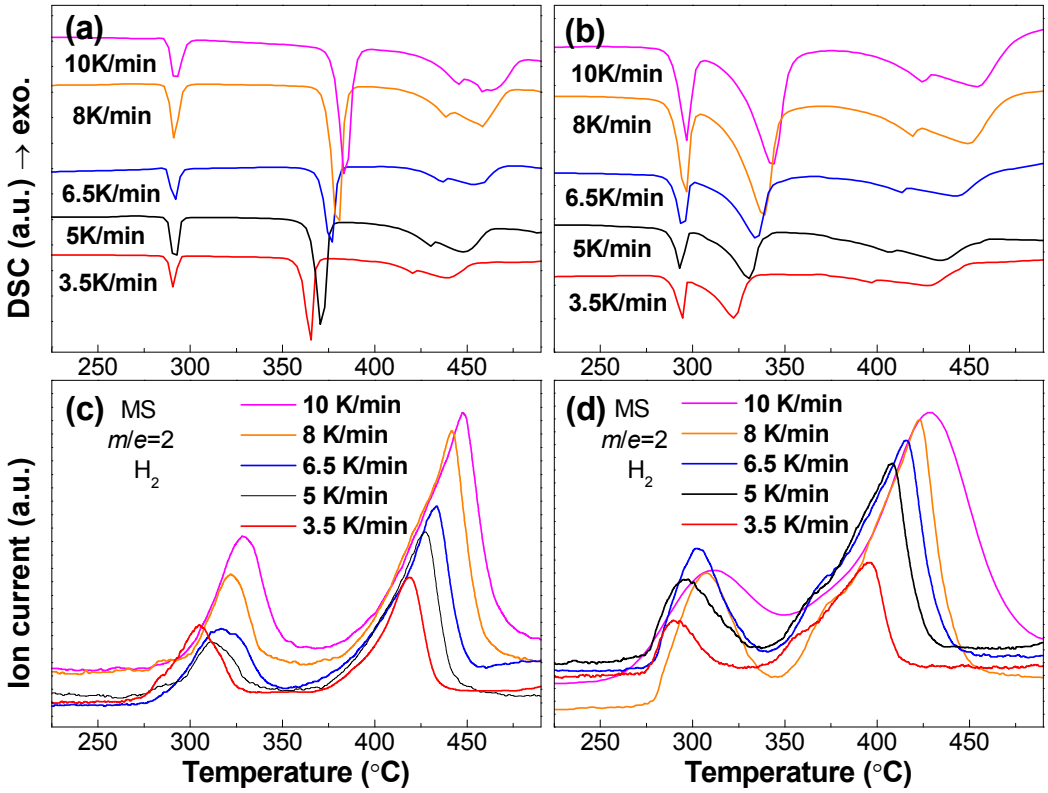

Figure S2. DSC-MS curves of the as-milled $2LiBH_4$-MgH_2-$0.1MCl_2$ (M = Fe, Co, Ni) composites at various heating rates. (a) undoped, (b) doped with $0.1FeCl_2$, (c) doped with $0.1CoCl_2$, (d) doped with $0.1NiCl_2$.

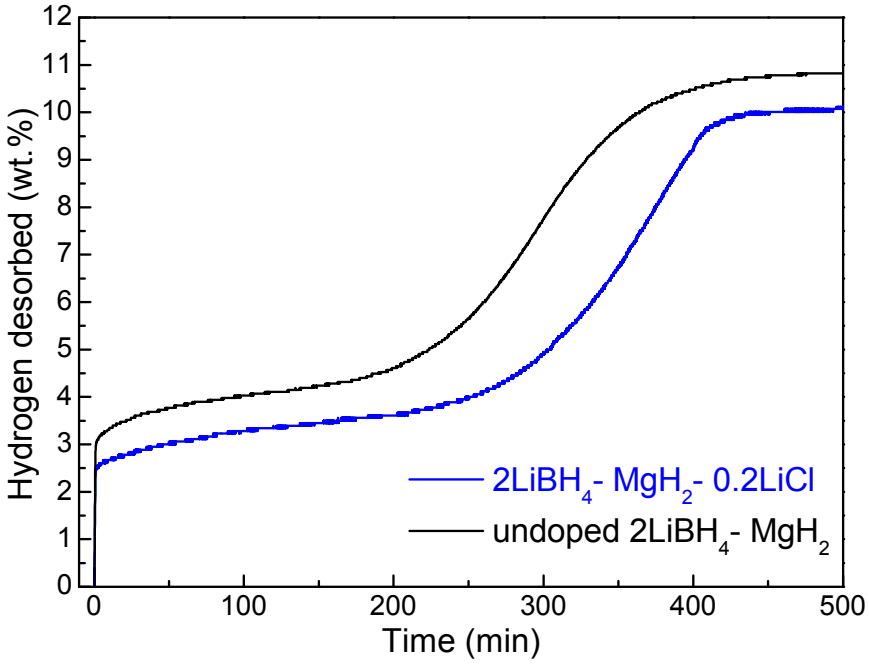

Figure S3. Isothermal dehydrogenation curves of the $2LiBH_4$-MgH_2-$0.2LiCl$ sample under 4 bar H_2 at 430 °C.

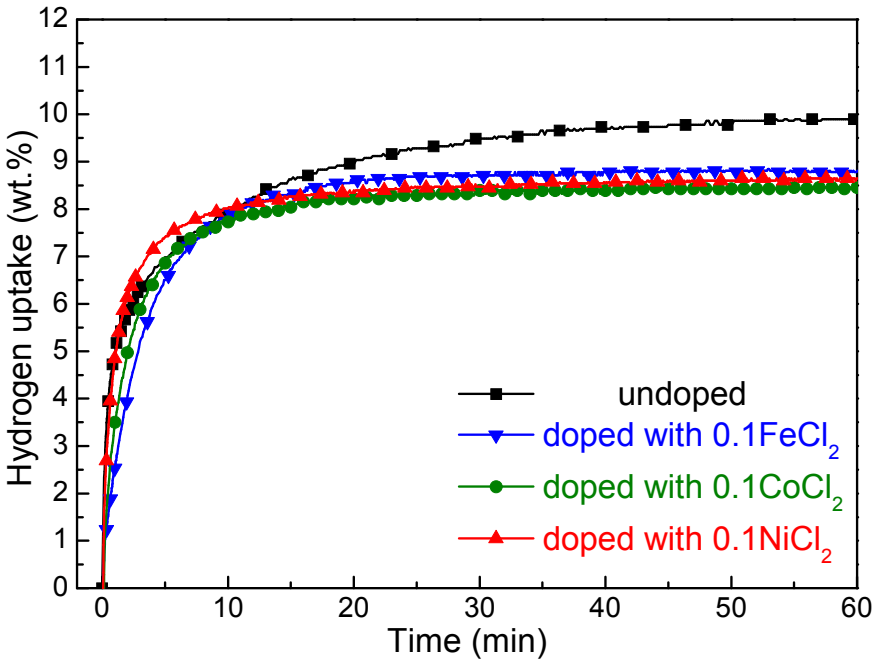

Figure S4. Isothermal rehydrogenation curves of the dehydrogenated $2LiBH_4$-MgH_2-$0.1MCl_2$ (M = Fe, Co, Ni) composites under 80 bar H_2 at 430 °C.

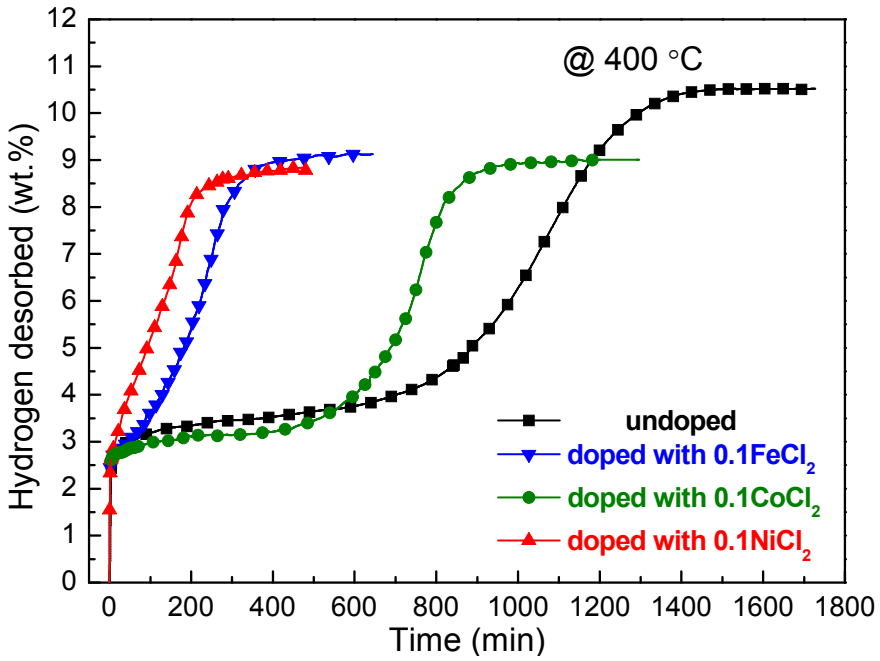

Figure S5. Isothermal dehydrogenation curves of the as-milled $2LiBH_4$-MgH_2-$0.1MCl_2$ (M = Fe, Co, Ni) samples under 4 bar hydrogen back pressure at 400 °C.

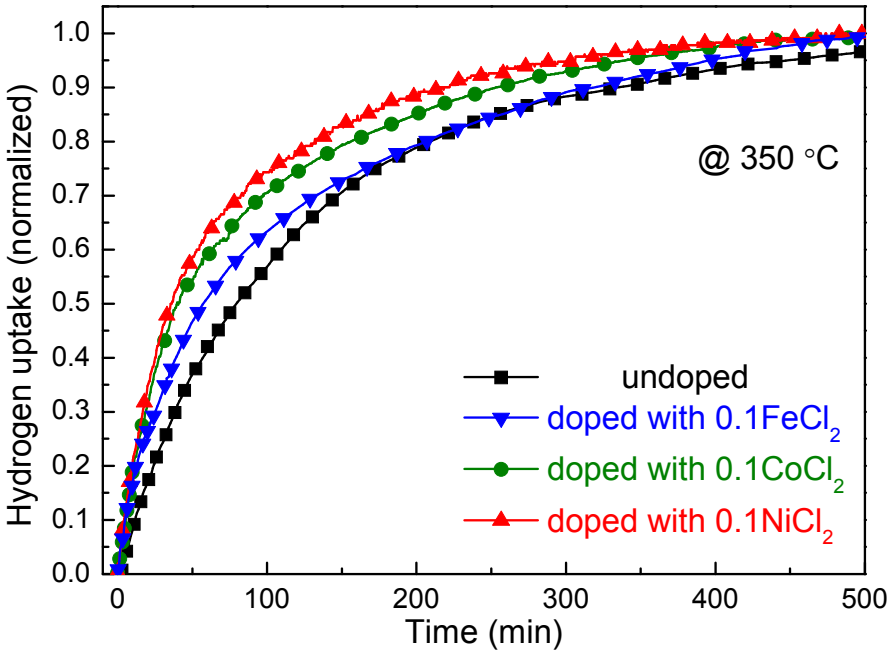

Figure S6. Normalized isothermal rehydrogenation curves of the dehydrogenated $2LiBH_4$-MgH_2-$0.1MCl_2$ (M = Fe, Co, Ni) composites under 80 bar H_2 at 350 °C.

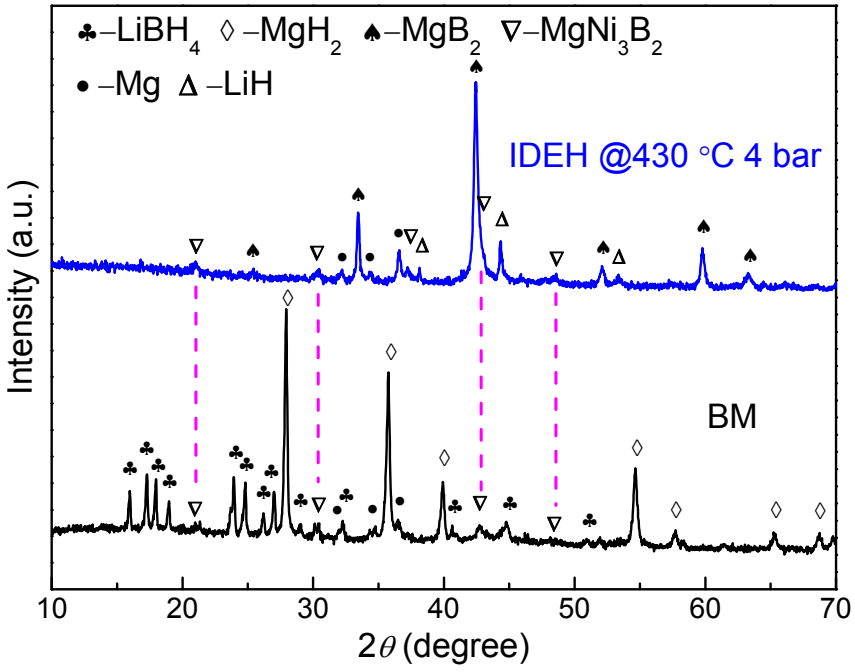

Figure S7. XRD patterns of the as-milled and isothermal dehydrogenated $2LiBH_4$-MgH_2-$0.033MgNi_3B_2$ sample.