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.

<table>
<thead>
<tr>
<th>Sample</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>undoped</td>
<td>116.5</td>
<td>293.1</td>
<td>371.5</td>
<td>448.3</td>
</tr>
<tr>
<td>2LiBH$_4$-MgH$_2$-0.1$\text{FeCl}_2$</td>
<td>103.4</td>
<td>291.9</td>
<td>330.5</td>
<td>434.9</td>
</tr>
<tr>
<td>2LiBH$_4$-MgH$_2$-0.1$\text{CoCl}_2$</td>
<td>104.2</td>
<td>287.7</td>
<td>311.2</td>
<td>427.6</td>
</tr>
<tr>
<td>2LiBH$_4$-MgH$_2$-0.1$\text{NiCl}_2$</td>
<td>104.9</td>
<td>286.1</td>
<td>297.5</td>
<td>408.4</td>
</tr>
</tbody>
</table>

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Figure S2. DSC-MS curves of the as-milled 2LiBH₄-MgH₂-0.1MCl₂ (M = Fe, Co, Ni) composites at various heating rates. (a) undoped, (b) doped with 0.1FeCl₂, (c) doped with 0.1CoCl₂, (d) doped with 0.1NiCl₂.

Figure S3. Isothermal dehydrogenation curves of the 2LiBH₄-MgH₂-0.2LiCl sample under 4 bar H₂ at 430 °C.
Figure S4. Isothermal rehydrogenation curves of the dehydrogenated 2LiBH₄-MgH₂-0.1MCl₂ (M = Fe, Co, Ni) composites under 80 bar H₂ at 430 °C.

Figure S5. Isothermal dehydrogenation curves of the as-milled 2LiBH₄-MgH₂-0.1MCl₂ (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$_3$B$_2$ sample.