# Electronic Supplementary Information

# Remarkable hydrogen storage properties at low temperature of Mg-Ni composites prepared by hydriding combustion synthesis and mechanical milling

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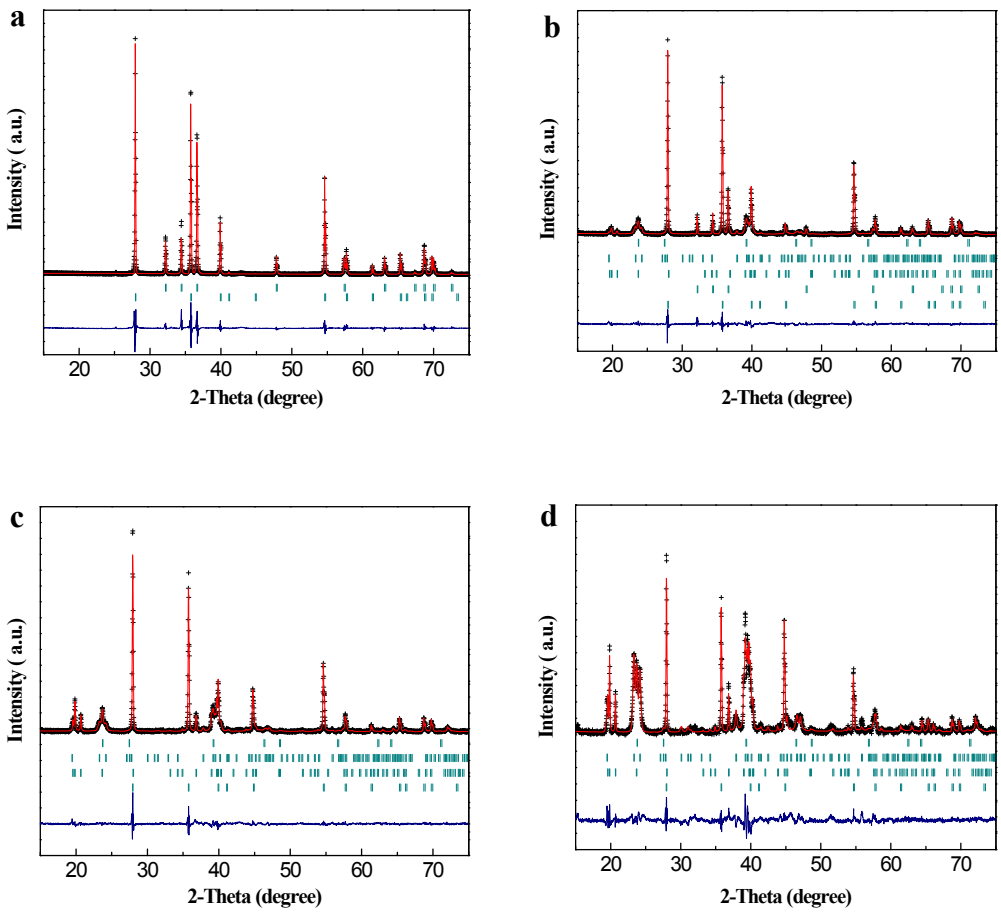


Fig. S1 The Rietveld analysis profiles of $Mg_{100-x}Ni_x$ (x=0, 5, 10 and 20) composites prepared by HCS. Observed (dots), Calculated (top line) and different curves (bottom line)

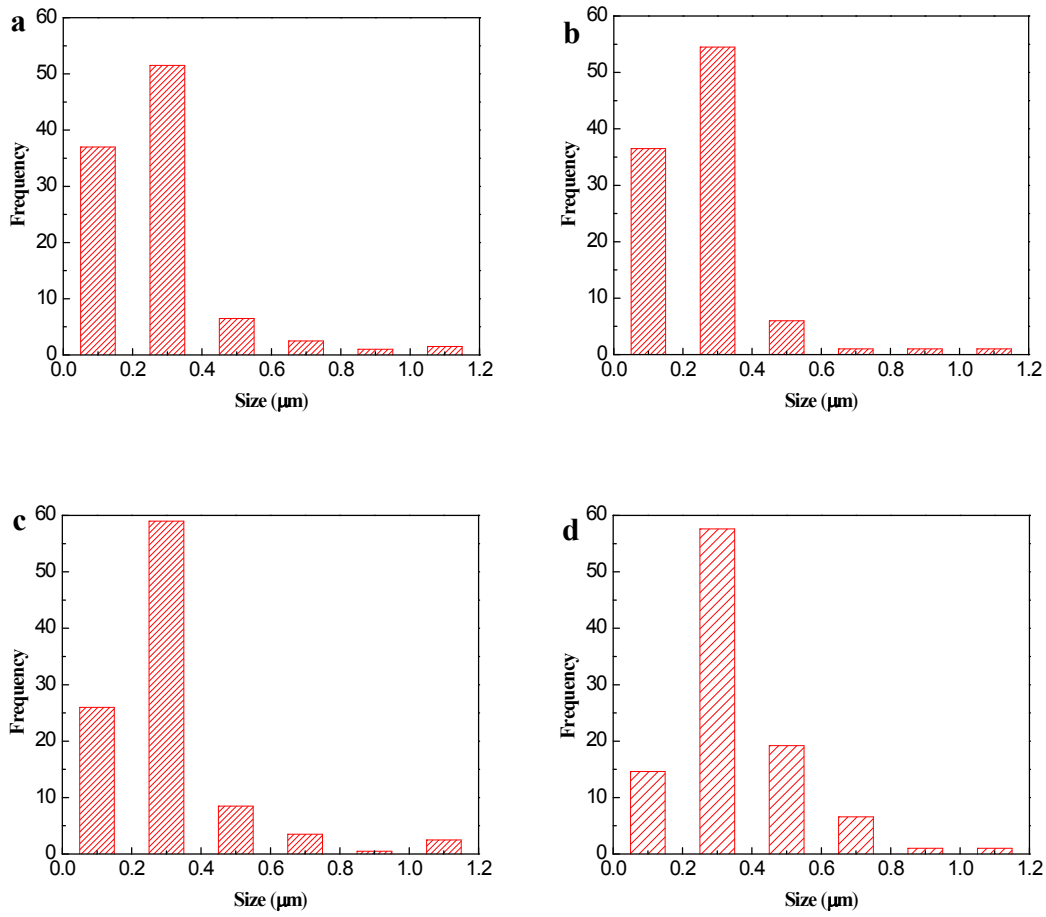


Fig. S2 Particle size distribution of $Mg_{100-x}Ni_x$ (x=0, 5, 10 and 20) composites according to the SEM images: (a), (b), (c) and (d) are corresponding to x=0, 5, 10 and 20, respectively.

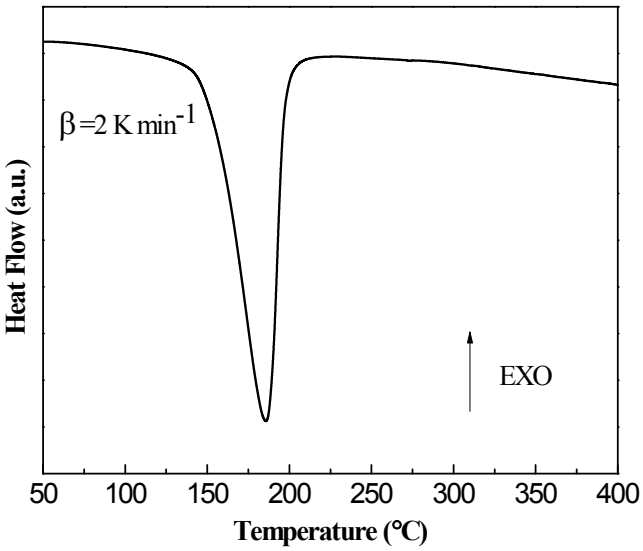


Fig. S3. DSC curve of $Mg_2NiH_4$ prepared by HCS+MM

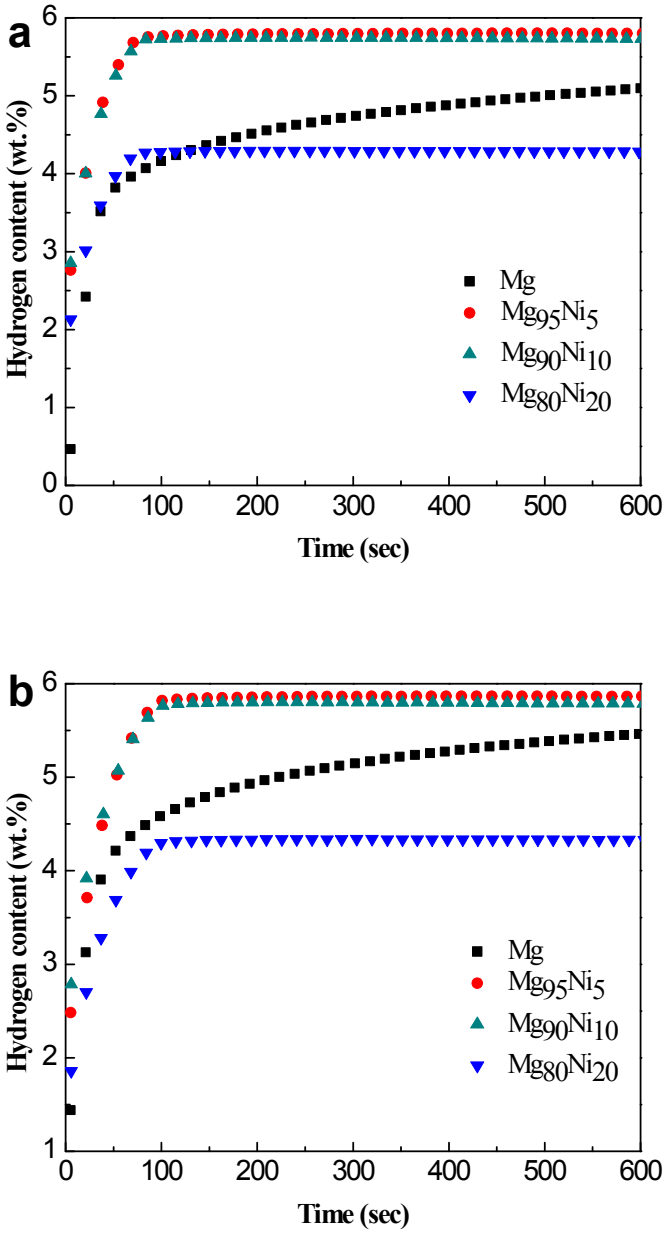


Fig. S4 Isothermal hydrogenation curves of the HCS+MM products of $Mg_{100-x}Ni_x$ (x=0, 5, 10 and 20) at (a) 493 K and (b) 523 K under 3.0 MPa hydrogen pressure

Table S1 Hydrogen absorption capacities of $Mg_{100-x}Ni_x$ (x=0, 5, 10 and 20) composites at 473 K, 493 K and 523 K under 3.0 MPa hydrogen pressure within 600 s

| Temperature (K) | Hydrogen absorption capacity (wt.%) | | | |
|---|---|---|---|---|
| | Mg | $Mg_{95}Ni_5$ | $Mg_{90}Ni_{10}$ | $Mg_{80}Ni_{20}$ |
| 313 K | 0 | 1.32 | 2.07 | 3.70 |
| 473 K | 3.25 | 5.80 | 5.69 | 4.27 |
| 493 K | 5.21 | 5.79 | 5.73 | 4.28 |
| 523 K | 5.58 | 5.86 | 5.78 | 4.32 |

Table S2 Isothermal dehydrogenation curves of $Mg_{100-x}Ni_x$ (x=0, 5, 10 and 20) composites at 473 K, 493 K and 523 K under 0.001 MPa hydrogen pressure within 120 min

| Temperature (K) | Hydrogen desorption capacity (wt.%) | | | |
|---|---|---|---|---|
| | Mg | $Mg_{95}Ni_5$ | $Mg_{90}Ni_{10}$ | $Mg_{80}Ni_{20}$ |
| 473 K | 0.22 | 0.87 | 1.09 | 1.84 |
| 493 K | 0.30 | 2.21 | 2.46 | 2.76 |
| 523 K | 0.78 | 5.36 | 5.24 | 3.92 |

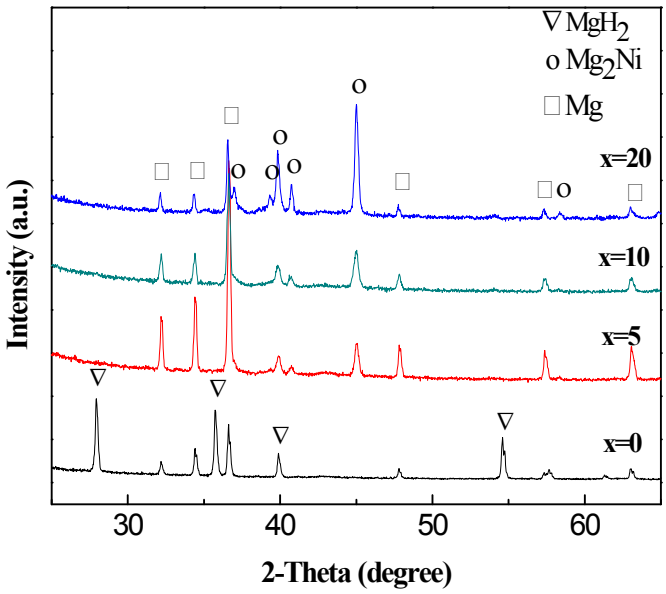


Fig. S5. XRD patterns of $Mg_{100-x}Ni_x$ (x=0, 5, 10 and 20) composites after dehydrogenation at 523 K

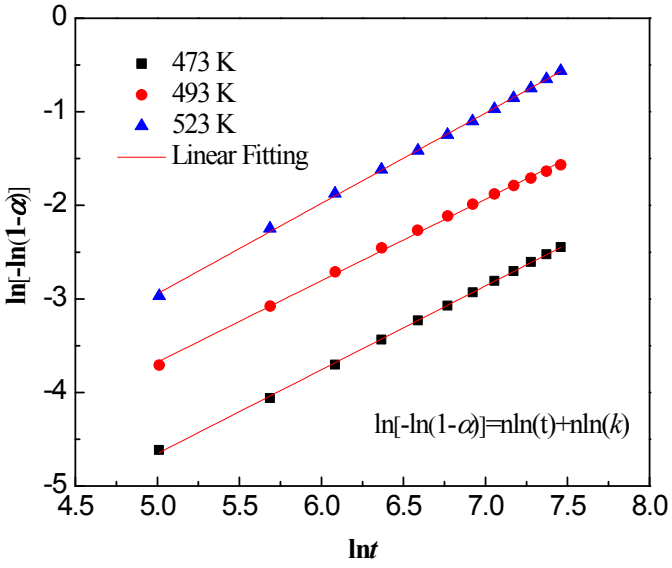


Fig. S6. JMA plots of ln[−ln(1−$\alpha$)] *vs* ln($t$) for the dehydrogenation of the $Mg_{90}Ni_{10}$ composite at different temperatures. The samples with reacted fraction of $0 < \alpha < 0.5$ was used