Electronic supplementary information (ESI)

# Temperature rise of $LaNi_5$-based alloys by hydrogen absorption

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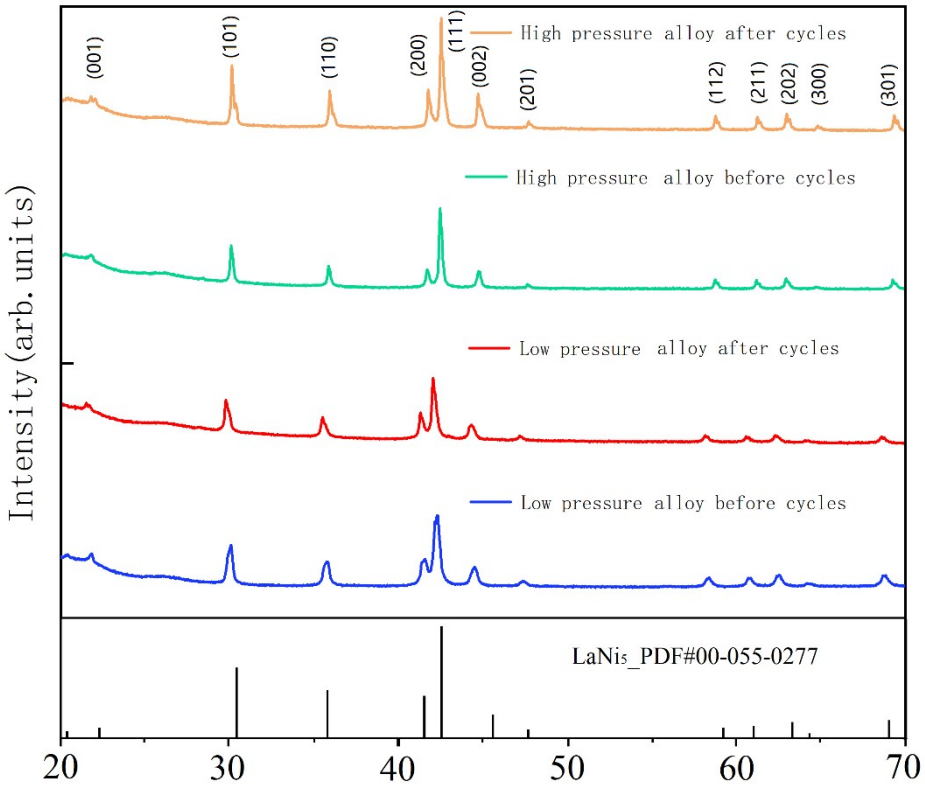
(a)




(b)

| Alloy | Lattice constant (Å) | | Lattice volume (Å$^3$) |
|---|---|---|---|
| | $a_0$ | $c_0$ | |
| High pressure alloy-before | 5.01 | 3.99 | 86.53 |
| High pressure alloy-after | 4.99 | 4.03 | 86.92 |
| Low pressure alloy-before | 5.02 | 4.07 | 89.03 |
| Low pressure alloy-after | 5.02 | 4.08 | 89.17 |

**Fig. S1** (a) XRD patterns before and after hydrogen storage cycles of the $AB_5$-type alloys as purchased, which is $La_{0.803}Ce_{0.140}Pr_{0.0148}Nd_{0.0427}Ni_{3.99}Co_{0.61}Mn_{0.30}Al_{0.27}$ ( referred as low-pressure $AB_5$ alloy ), $La_{0.241}Ce_{0.543}Pr_{0.0538}Nd_{0.163}Ni_{3.986}Co_{0.601}Mn_{0.360}Al_{0.053}$ ( referred as high-pressure $AB_5$ alloy ) together with the data of $LaNi_5$ (JCPDS file No. 00-055-0277). XRD indicates that low-pressure $AB_5$ alloy and high-pressure $AB_5$ alloy have hexagonal CaCu5-type crystal structure, and the crystal structures will not change due to hydrogen storage. (b) The lattice constants and cell volume of the presented alloys, the lattice experienced an expansion after cycles

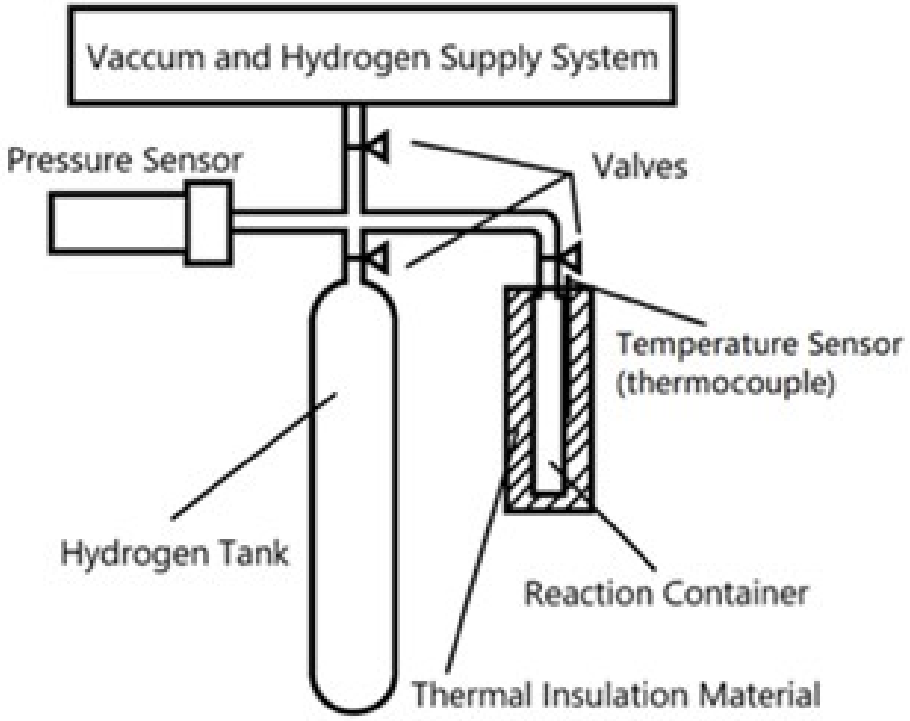



**Fig. S2** Conceptive picture of specially designed heat generation rate measurement apparatus. A thermocouple was attached on the surface of the vessel to record the surface temperature. A big hydrogen tank was used to maintain sufficient operating pressure.

| *Materials* | *Data source* |
|---|---|
| $H_2$, $CH_4$, $NH_3$, water, $C_2H_5OH$, Methylcyclohexane, Toluene, $CCl_4$ | NIST chemistry webbook[1] |
| N-Octane, Benzene | Literature[2] |
| $NbH_2$, $PdH_{0.7}$, $LaNi_5$ | Literature[3] |
| $MgH_2$ | Literature[4] |
| LiH | Literature[5] |
| Low-pressure $AB_5$ alloy, high-pressure $AB_5$ alloy | By authors |
| $LaNi_{4.8}Sn_{0.2}$ | Literature[6] |

**Fig. S3** Table of the data source in Fig.5 and Fig.6

# References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