Electronic Supplementary Information

A cost-effective NiMoB–$La(OH)_3$ catalyst for hydrogen generation by decomposition of alkaline hydrazine solution

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Summary: 3 Pages; 2 Tables; 2 Figures

Table S1 A comparison of catalytic decomposition performance of $N_2H_4 \cdot H_2O$ using 55 wt% $Ni_{64.1}Mo_{11.5}B_{24.4}$–$La(OH)_3$ and other catalysts from open literature

	Reaction condition					
Catalyst	Catalyst/N_2H_4 (molar ratio)	T (°C)	NaOH (M)	H_2 selectivity (%)	TOF (h^{-1})	Ref.
$Ni_{0.95}Ir_{0.05}$	0.1	25	0	100	1.6	[8]
$Ni_{0.99}Pt_{0.01}$	0.1	70	0	100	6	[9]
$NiPt_{0.057}$–Al_2O_3–HT	0.4	30	0	98	16.8	[10]
Rh_4Ni/GO	0.1	25	5	100	12	[11]
$Ni_{50}Fe_{50}$	0.1	70	0.4	100	3.2	[13]
Ni_3Fe/C	—	25	0	100	556	[14]
Ni–Al_2O_3–HT	0.4	30	0	93	2.2	[15]
$Ni_{64.1}Mo_{11.5}B_{24.4}$–$La(OH)_3$	0.3	50	2	100	13.3	This work

Table S2 XPS binding energies (eV) of the $Ni_{74.1}B_{25.9}$, $Ni_{66.2}Mo_{9.6}B_{24.2}$ and 55 wt% $Ni_{64.1}Mo_{11.5}B_{24.4}$–$La(OH)_3$ catalysts

Sample	Element	Peak BE (eV)	Likely metal/compound
$Ni_{74.1}B_{25.9}$	$Ni2p_{3/2}/2p_{1/2}$	852.4/870	Ni^0
		853.1/871.5	$NiO/Ni(OH)_2$
		856.7/874.9	
	B1s	187.8	B^0
		192	B_2O_3
$Ni_{66.2}Mo_{9.6}B_{24.2}$	$Ni2p_{3/2}/2p_{1/2}$	852.1/869.6	Ni^0
		852.8/871.2	$NiO/Ni(OH)_2$
		857/875.5	
	$Mo3d_{5/2}/3d_{3/2}$	228.3/231.4	Mo^0
		229.5/232.6	MoO_2
		232.4/235.5	MoO_3
	B1s	187.4	B^0
		191.7	B_2O_3
55 wt% $Ni_{64.1}Mo_{11.5}B_{24.4}$–$La(OH)_3$	$Ni2p_{3/2}/2p_{1/2}$	852.1/869.5	Ni^0
		852.8/872.3	$NiO/Ni(OH)_2$
		859.2/872.7	
	$Mo3d_{5/2}/3d_{3/2}$	228.1/231.1	Mo^0
		229.7/232.9	MoO_2
		232.5/235.7	MoO_3
	B1s	191	B_2O_3
	$La3d_{5/2}$	834.4–838.1	$La(OH)_3$

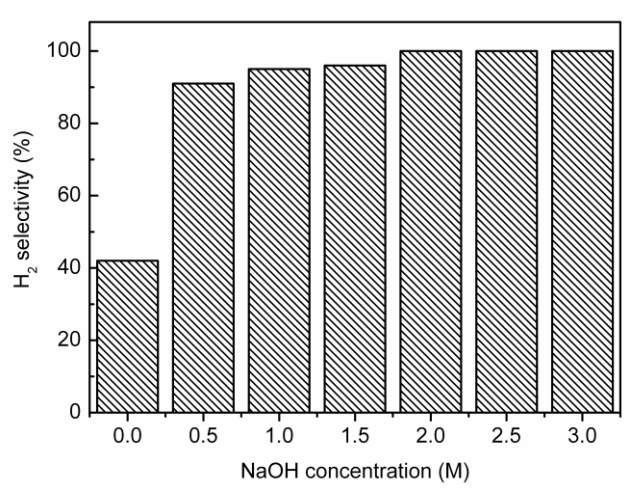

Fig. S1 Effect of NaOH concentration on H_2 selectivity of the system composed of 4 mL of 0.5 M $N_2H_4{\cdot}H_2O$ solution with the presence of 55wt% $Ni_{64.1}Mo_{11.5}B_{24.4}$–$La(OH)_3$ catalyst (catalyst/$N_2H_4{\cdot}H_2O$ = 0.3) at 50 °C.

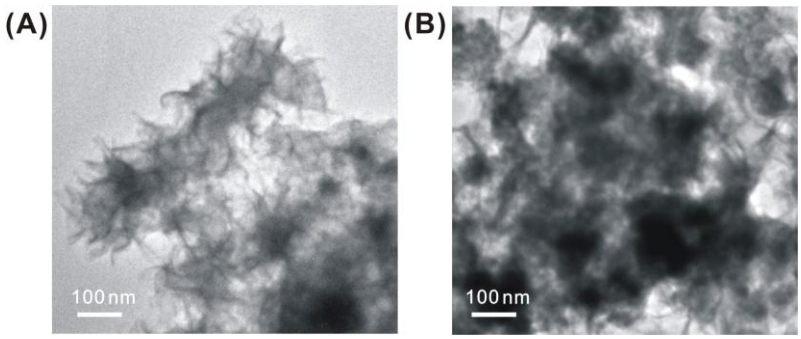

Fig. S2 TEM images of 55 wt% $Ni_{64.1}Mo_{11.5}B_{24.4}$–$La(OH)_3$ catalyst before (A) and after (B) reaction with $N_2H_4{\cdot}H_2O$.