Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

A monolithic sponge catalyst for hydrogen generation from sodium borohydride solution for portable fuel cells

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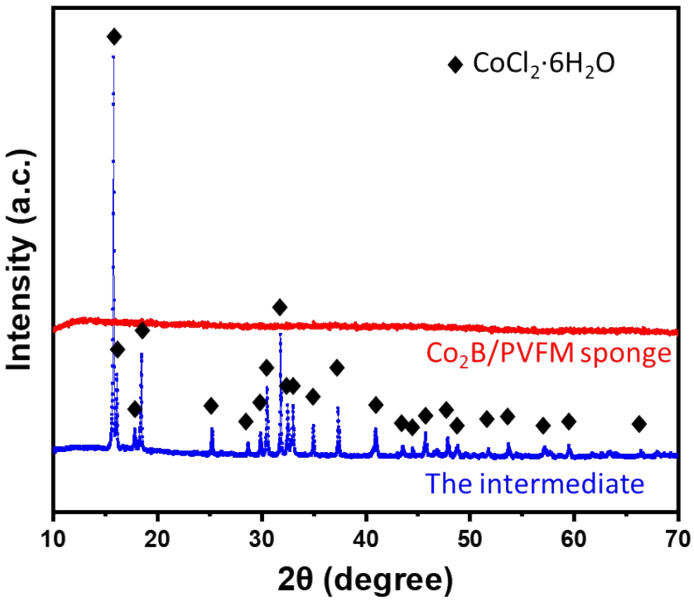

Figure S1 XRD pattern of Co_2B/PVFM sponge and the intermediate.

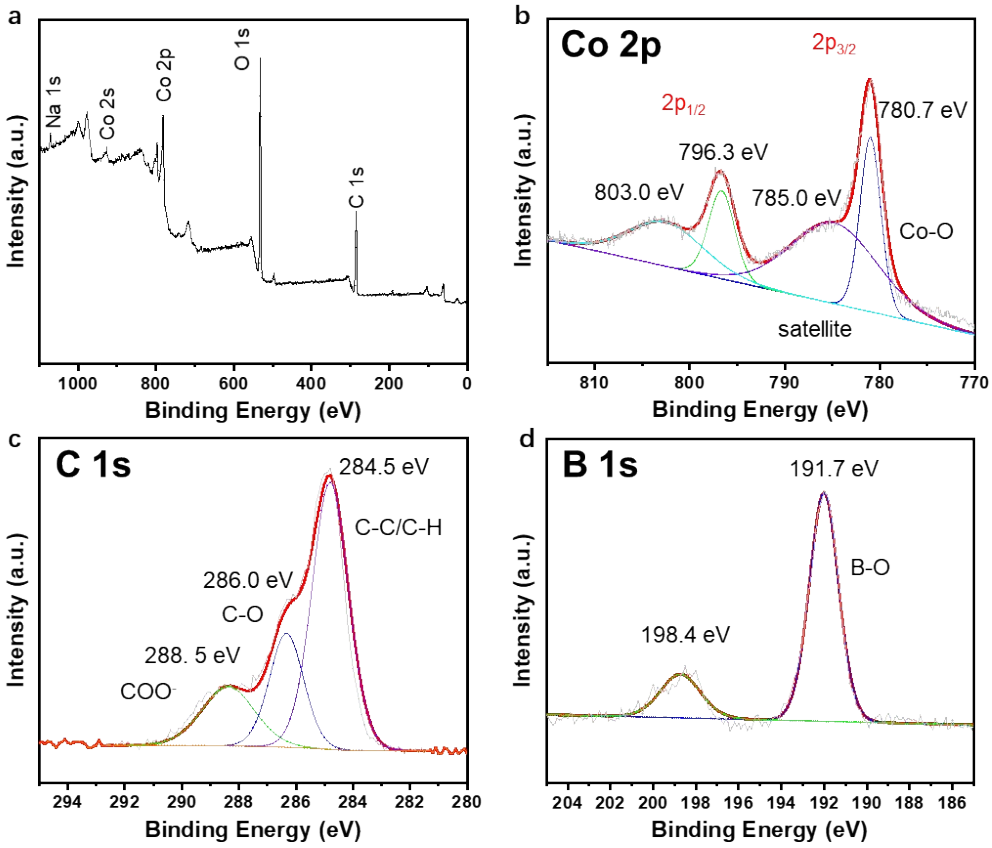

Figure S2 XPS spectra and curve fitting profiles of Co_2B/PVFM sponge: (a) survey, (b) Co 2p, (c) C 1s and (d) B 1s.

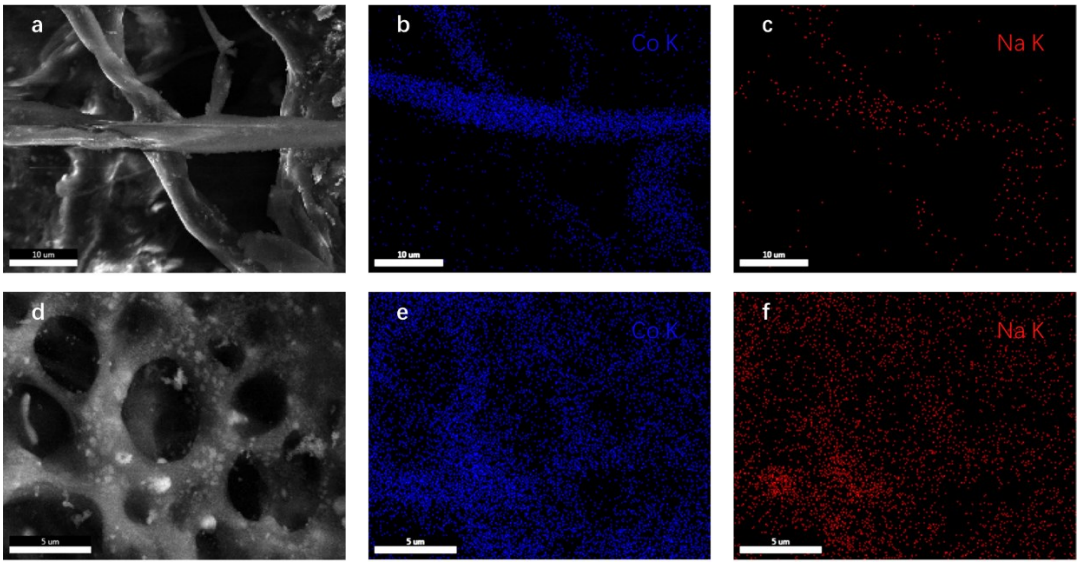

Figure S3 SEM images and EDS mapping of the Co_2B/PVFM sponge after catalyzing the hydrolysis of 10 wt% (a, b, c) and 30 wt% (d, e, f) $NaBH_4$ solution.

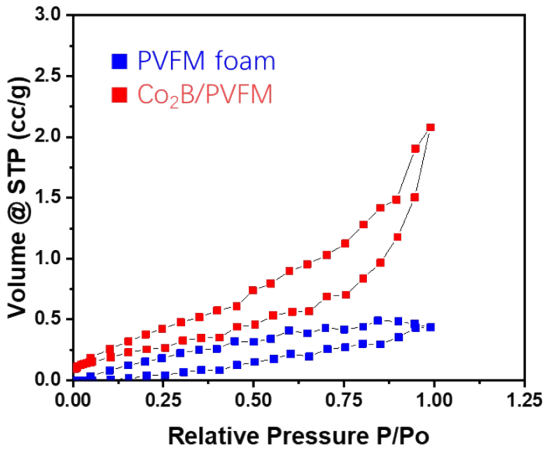

Figure S4 The BET curves of pristine PVFM and Co_2B/PVFM

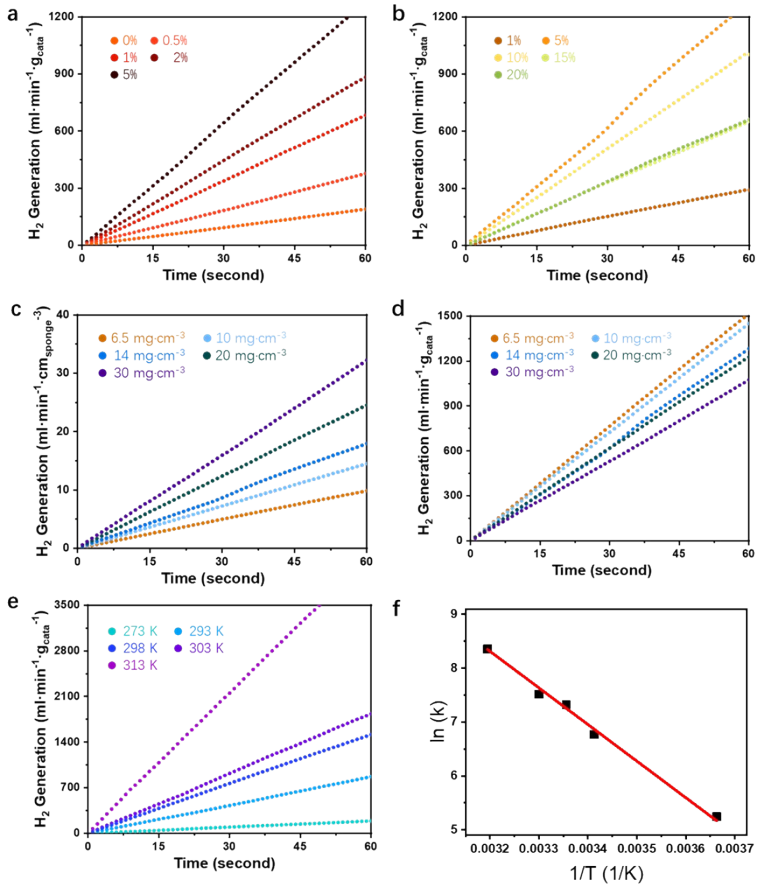

Figure S5 Study of the H_2 generation kinetics from Co_2B/PVMF sponge catalysed hydrolysis of $NaBH_4$ in different conditions: (a) Different NaOH concentrations (10 wt% $NaBH_4$ at 298K). (b) Different $NaBH_4$ concentrations (5 wt% NaOH, 298K). (c-d) Different Co-B loading (5 wt% $NaBH_4$, 5 wt% NaOH at 298K). The hydrogen generation rate is expressed in per volume of catalyst and per mass of catalyst in (c) and (d), respectively. (e) different temperature (5 wt% $NaBH_4$, 5 wt% NaOH). (f) An Arrhenius plot for H_2 generation based on (e).

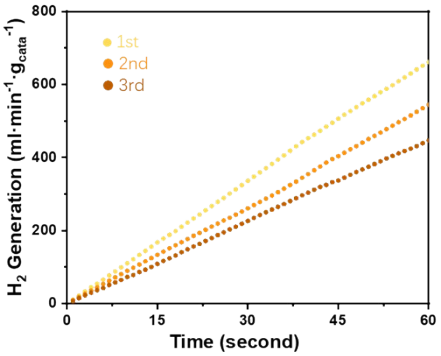

Figure S6 The hydrolysis kinetics of 20 wt% $NaBH_4$ solution at 298 K catalysed by the Co_2B/PVMF sponge catalyst in 3 consecutive test.

Table S1 Comparation among Co-B catalysts of different work

Catalyst (composition and form)	Catalyst amount	Catalytic activity	Temperature	Mass fraction of $NaBH_4$ and NaOH	Activation energy($kJ \cdot mol^{-1}$)	Reference
CoB/Ni-foam	15 $mg \cdot cm^{-2}$	1930 $ml \cdot min^{-1} g_{CoB}^{-1}$	293 K	1 wt% $NaBH_4$ & 5 wt% NaOH		1
PVDF/$CoCl_2$	0~5 wt_{CoCl2} %	1709 $ml \cdot min^{-1} mol_{CoCl}^{-1}$	298 K	5 wt% $NaBH_4$ & 5 wt% NaOH		2
PVDF/$CoCl_2$/Y-zeolite	5 wt_{Co} %	1977 $ml \cdot min^{-1} mol_{CoCl}^{-1}$	333 K	0.6 wt% $NaBH_4$	49	3
Co-B@AHs			303 K	5 wt% $NaBH_4$ & 5 wt% NaOH	56	4
Co_2B/PVFM	6.5 mg/cm^3	1500 $ml \cdot min^{-1} mol_{cata}^{-1}$	298 K	5 wt% $NaBH_4$ & 5% NaOH	56	this work

The calculation of hydrogen storage density

The calculation used to determine the hydrogen storage density of our system is as following:

$D_H = \frac{m_H}{m_s} \times 100\%$, where D_H represents the hydrogen storage density, m_H represents the mass of H_2 released by our system during hydrolysis, m_S represents the mass of the materials, including sponge catalyst and $NaBH_4$ solution(water included).

Reference

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