Supplementary information for

Electrodeposition of activated carbon on Ni foam for monolithic catalysts and intensification of hydrogenation performance in a micropacked bed

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S1. Specifications and manufacturers of the reagents and instruments

Commercial NF (Kunshan Jiayisheng Electronic Co., Ltd., China), deionized water (self-prepared), alcohol (Shanghai Titan Technology Co., Ltd., China), PVA (Beijing Anxinkang Technology Co., Ltd., China), HNO_3 (Beijing Lanyi Chemical Products Co., Ltd., China), AC powders (Shanghai Hainuo Charcoal Co., Ltd., China), $PdCl_2$ (Beijing Bailingwei Technology Co., Ltd., China), and HCl (Beijing Lanyi Chemical Products, Co., Ltd., China) were employed for the preparation of coatings and monolithic catalysts. During the preparation process, the NFs were cleaned by an ultrasonic cleaner (KQ5200DE, Kunshan Ultrasonic Instrument Co., Ltd., China) with the frequency of 40 kHz and the power of 200 W. The suspension was generated and circulated by a peristaltic pump (BT00-300M, Baoding Lange Constant Flow Pump Co., Ltd., China). The two electrodes were connected to an alternating current power supply (LF-2000, Beijing Longfang Technology Co., Ltd., China). After the loading of Pd, the samples were reduced in a tubular furnace (Hefei Kejing Material Technology Co., Ltd., China).

The average particle size of the powders was measured by a nano particle size and zeta potential analyzer (Delsa Nano C, Beckman Coulter Inc., U.S.). The surface morphologies of the coatings and the catalysts were analyzed by a scanning electron microscope (SEM, JSM-7001F, Japan Electronics Co., Ltd., Japan). The element distributions of the coatings and the catalysts were determined by an energy dispersive spectrometer (EDS, INCA X-MAX, Oxford Instruments, U.K.), which was connected to SEM. The textural properties of the coatings and the catalysts were measured at -196

°C by a dynamic nitrogen adsorption apparatus (Autosorb-1-C, Quantachrome Instruments, U.S.), and the samples were vacuumized at 200 °C for 6 h.

AMS (Shanghai Meryer Chemical Technology Co., Ltd., China), methylcyclohexane (Shanghai Meryer Chemical Technology Co., Ltd., China), methanol (Shanghai Titan Technology Co., Ltd., China) were employed for the evaluation of mass transfer and hydrogenation performance. During the evaluation process, the liquid was fed by a pump (DP-S10, Beijing Oushisheng Technology Co., Ltd., China). After the reaction, the liquid samples were collected and analyzed by a gas chromatography (GC, 8860, Agilent Technologies Co., Ltd., U.S.), which was equipped with a flame ionization detector and a capillary column (HP-5, 30 m×0.32 mm×0.25 μm).

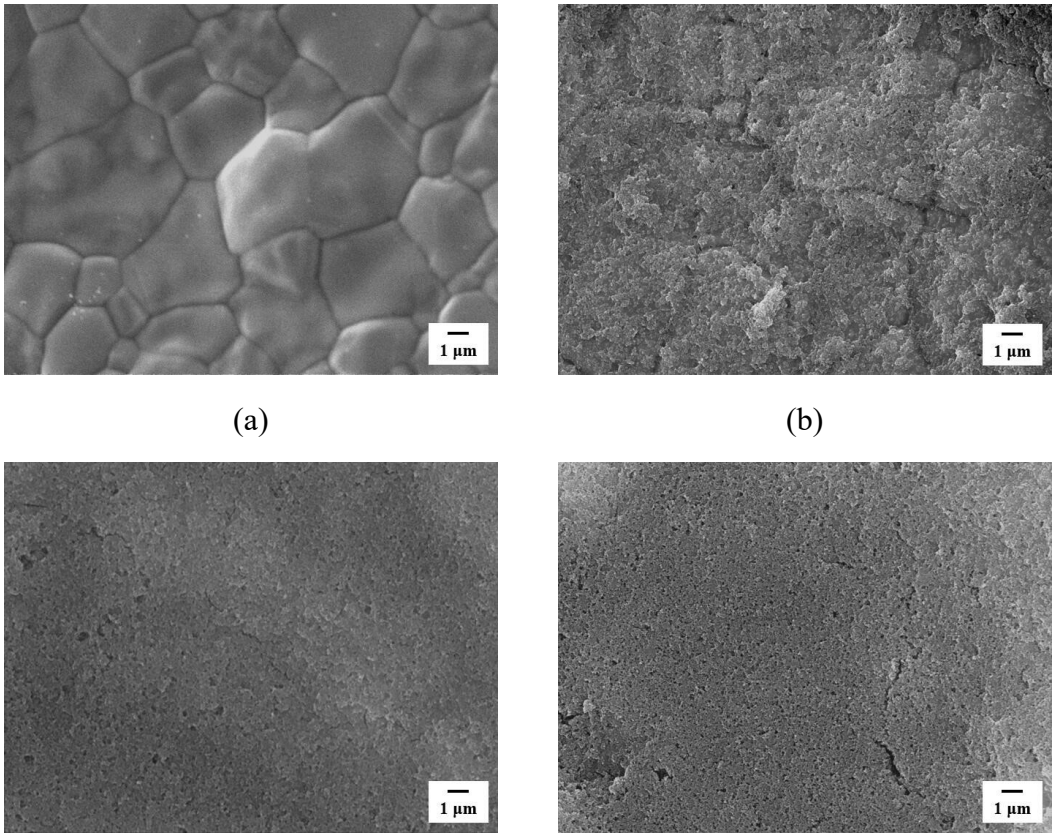


Fig. S1 SEM micrographs of (a) NF, AC coatings on the NFs by SC with AC concentration and suspension flow rate of (b) 6.0 wt% and 162 mL·min^{-1}, (c) 12.0 wt% and 162 mL·min^{-1}, and (d) 12.0 wt% and 198 mL·min^{-1} under the magnification of 5000.

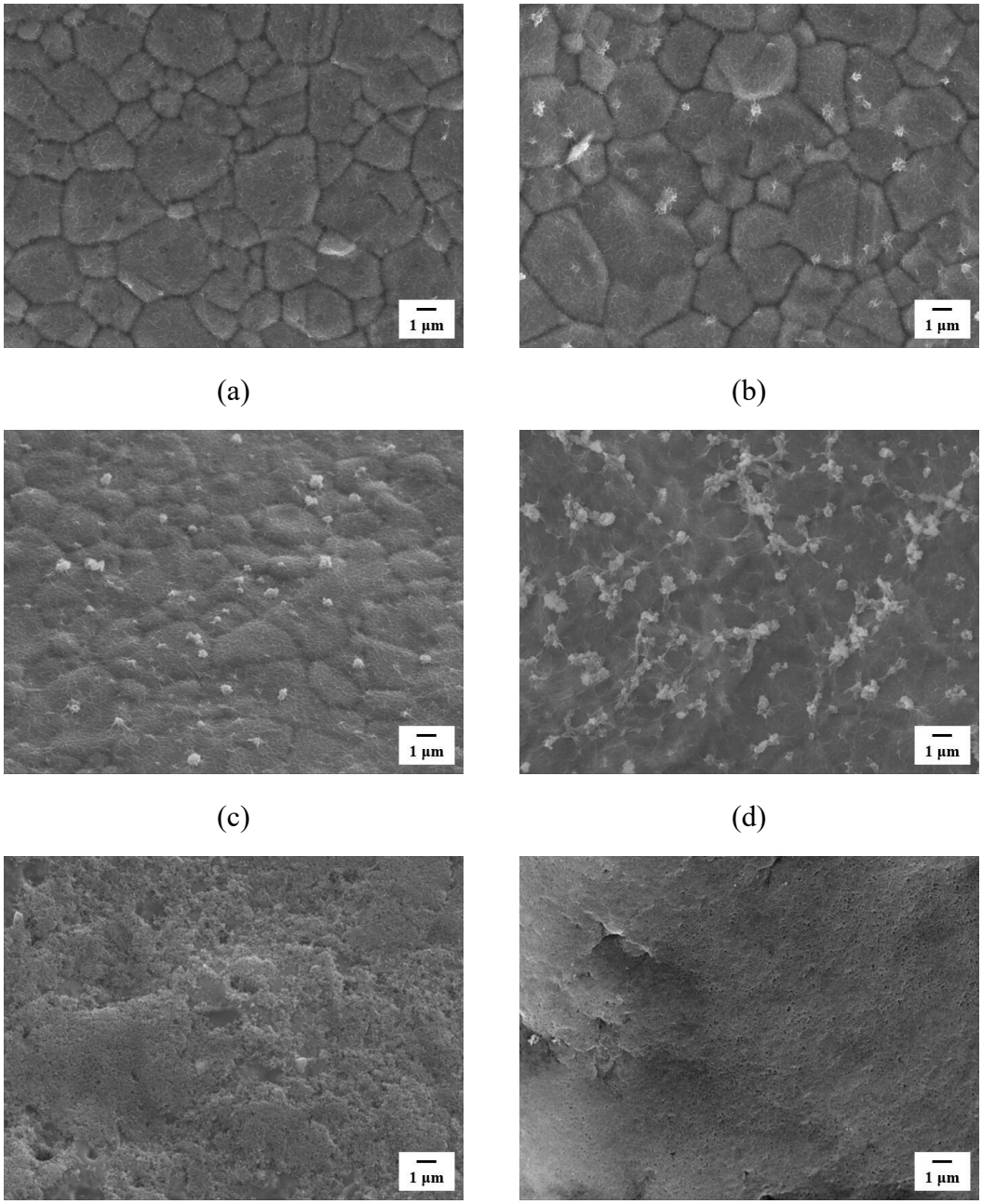
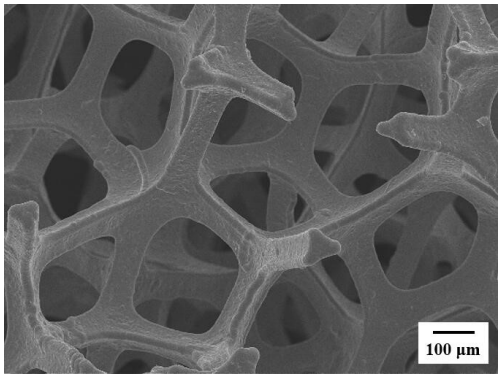
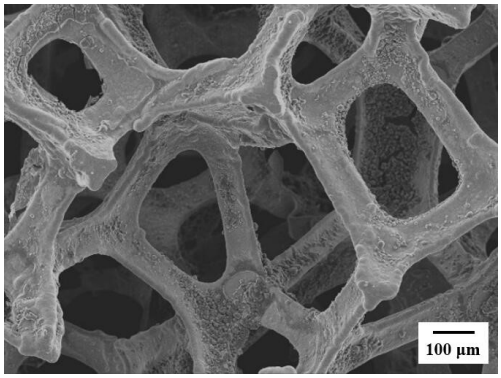


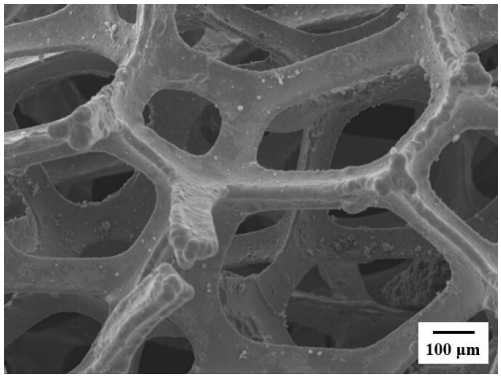
Fig. S2 SEM micrographs of AC coatings on the NFs by ED with AC concentration of (a) 1, (b) 2, (c) 4, (d) 6, (e) 8, and (f) 10 $g \cdot L^{-1}$ under the magnification of 5000.



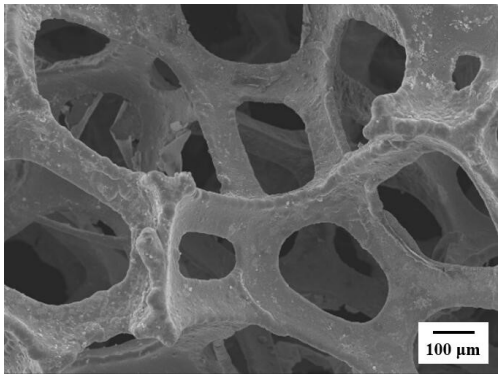
(a)



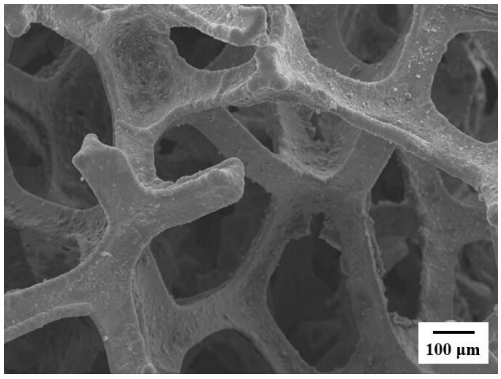
(b)



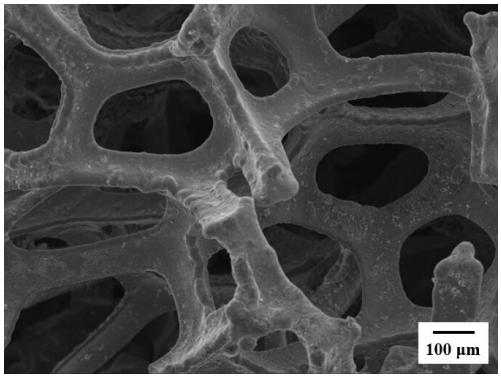
(c)



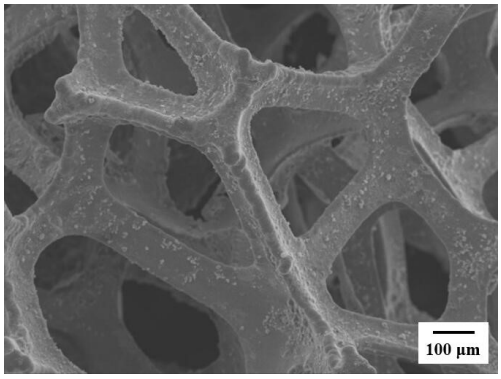
(d)



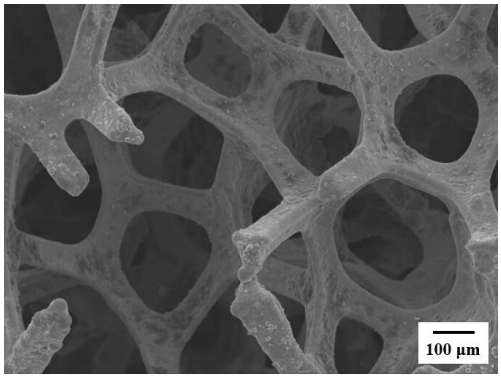
(e)



(f)



(g)



(h)

Fig. S3 SEM micrographs of (a) NF, AC coatings on the NFs by (b) SC and ED with AC concentration of (c) 1, (d) 2, (e) 4, (f) 6, (g) 8, and (h) 10 $g \cdot L^{-1}$ under the magnification of 100.

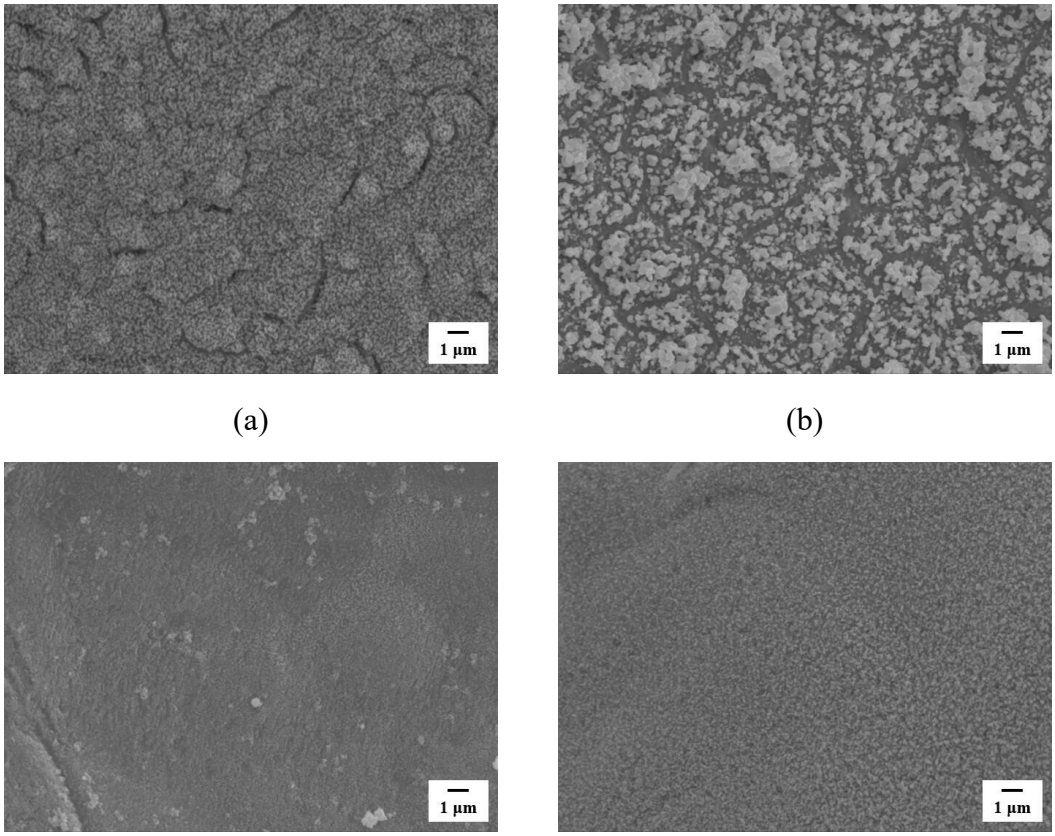


Fig. S4 SEM micrographs of Pd/AC/NF catalysts by (a) SC and ED with AC concentration of (b) 2, (c) 6, and (d) 10 $g \cdot L^{-1}$ under the magnification of 5000.

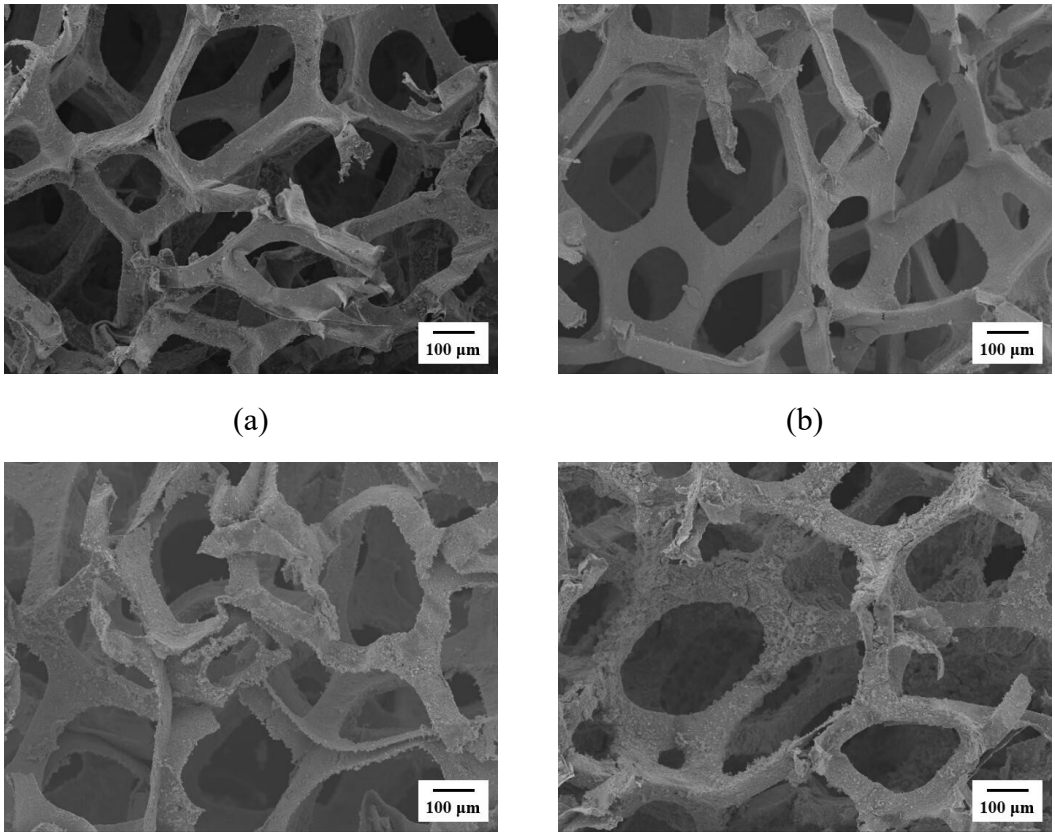


Fig. S5 SEM micrographs of Pd/AC/NF catalysts by (a) SC and ED with AC concentration of (b) 2, (c) 6, and (d) 10 $g \cdot L^{-1}$ under the magnification of 100.