Supporting Information

Rationally Constructing Nano MOF-derived Ni and CQDs Embedded N-doped Carbon Nanosphere for Hydrogenation of Petroleum Resin at Low Temperature

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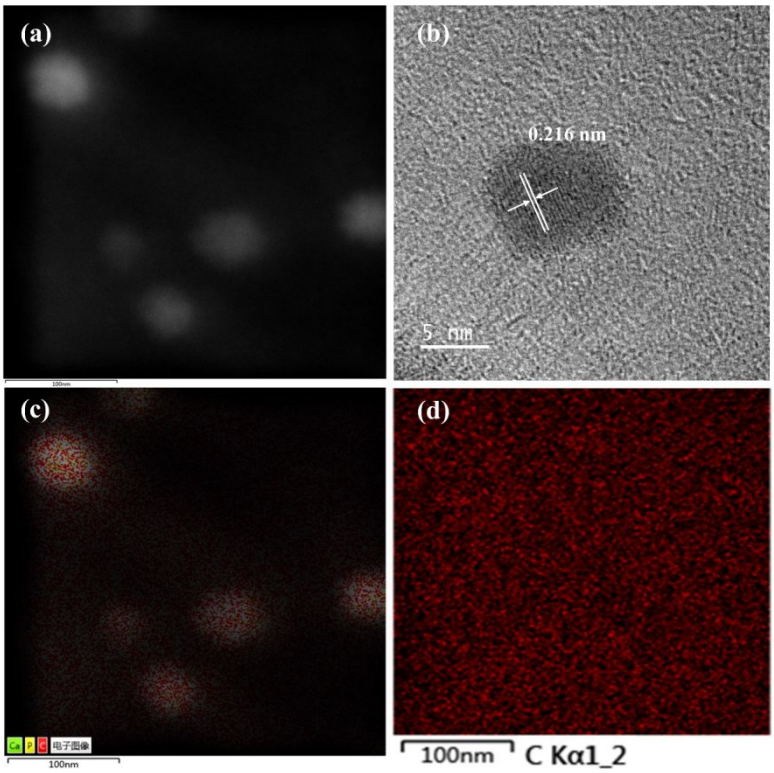

Fig S1. The HRTEM (a, b) and element mapping images (c, d) of pure CQDs prepared by thermal treatment of polyethylene glycol at 180 ℃ for 6 h.

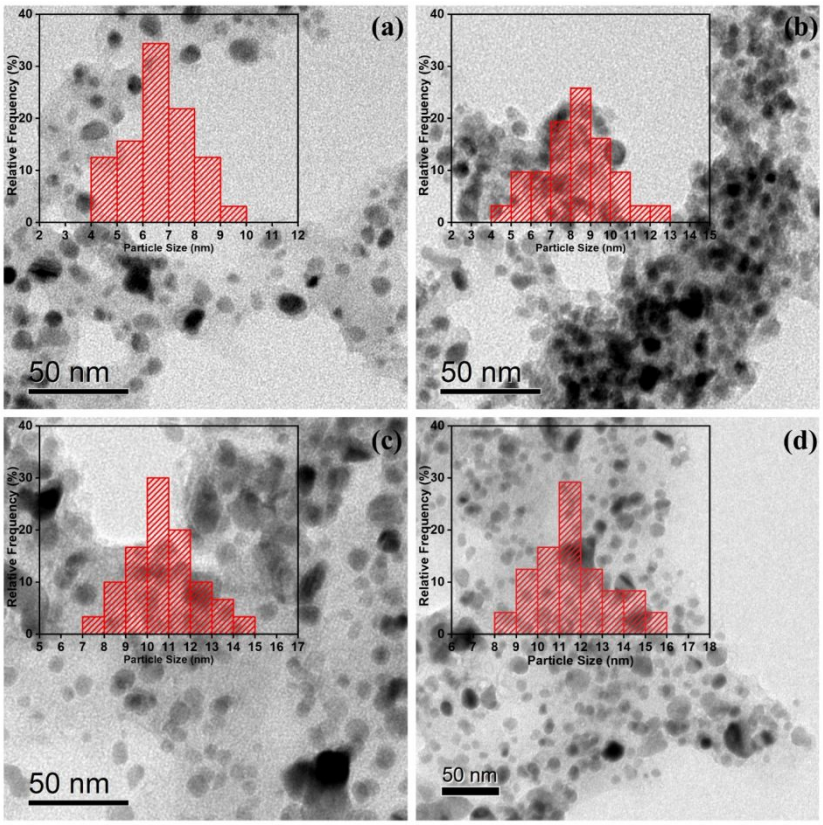

Figure S2. TEM images and insect the size distribution of Ni-CQDs/NCNs-450 (a), Ni-CQDs/NCNs-500 (b), Ni-CQDs/NCNs-550 (c), and Ni/NCNs-400 (d), respectively.

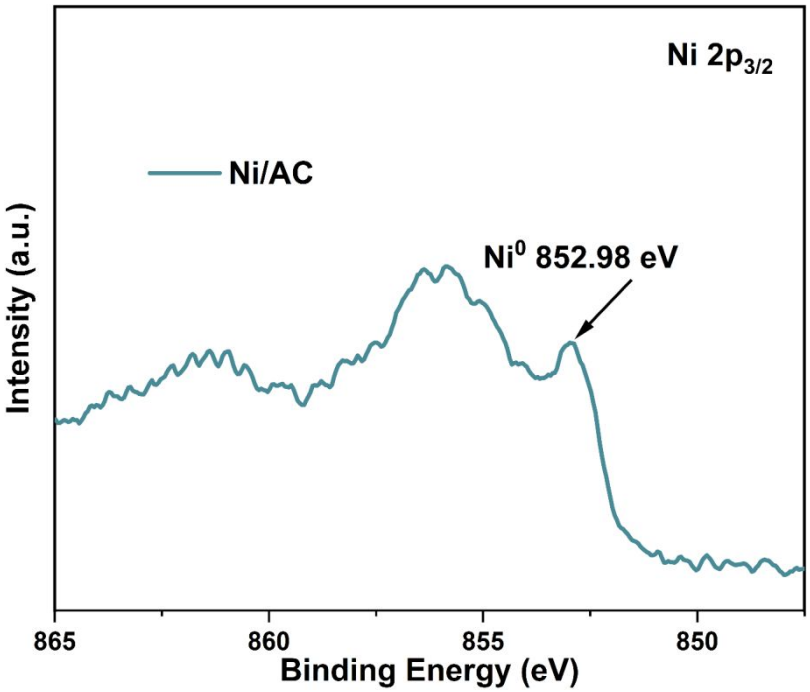

Figure S3. High-resolution XPS spectra of Ni $2p_{3/2}$ in Ni/AC

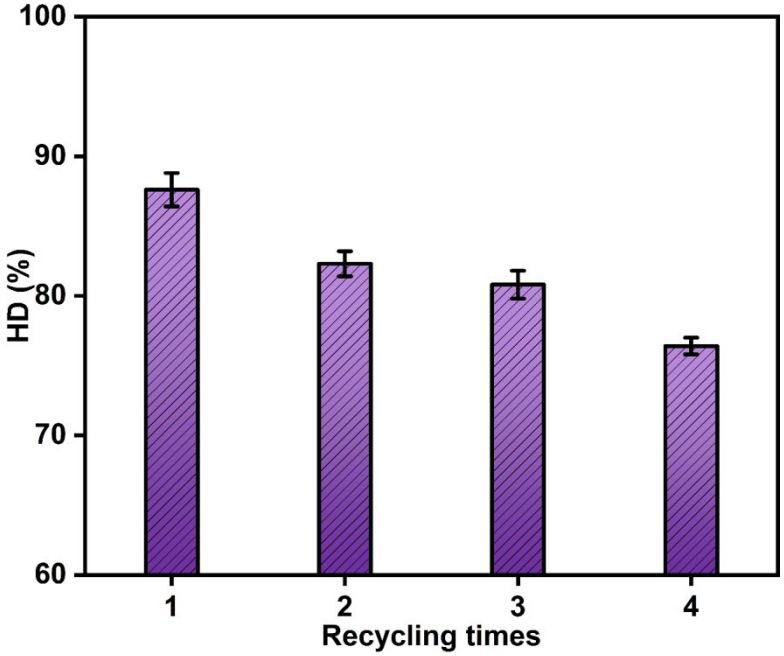

Figure S4. recyclability of Ni /NCNs-400.

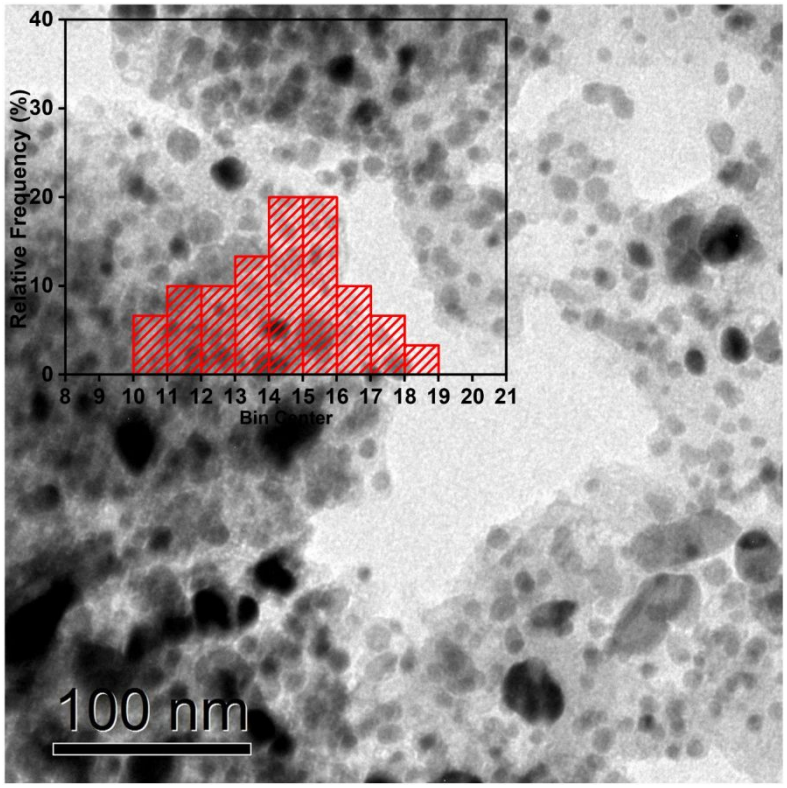

Figure S5. TEM image of used Ni /NCNs-400 after four runs.

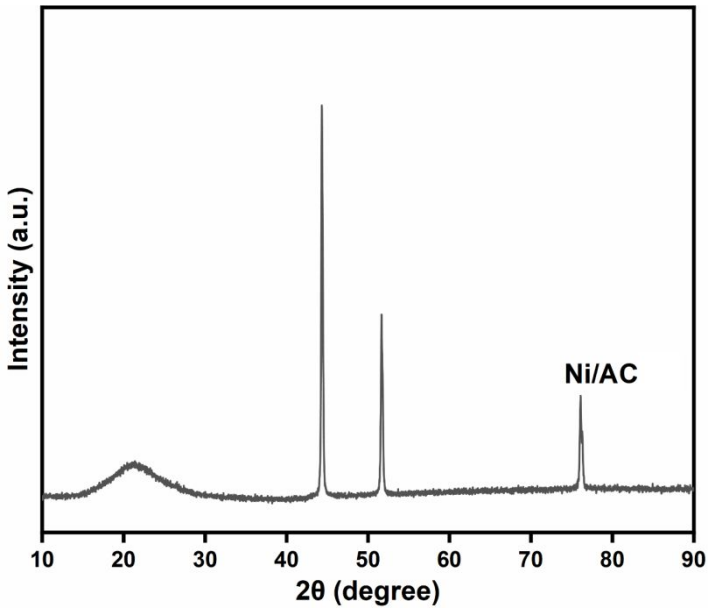

Figure S6. XRD pattern of Ni/AC

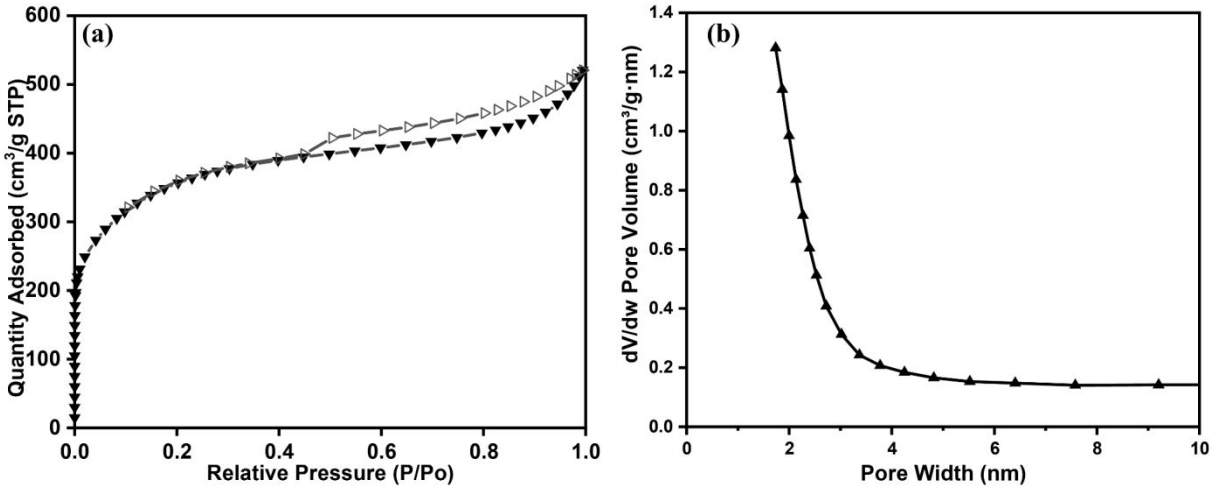

Figure S7. (a) Nitrogen adsorption isotherms, (b) pore distribution of Ni/AC

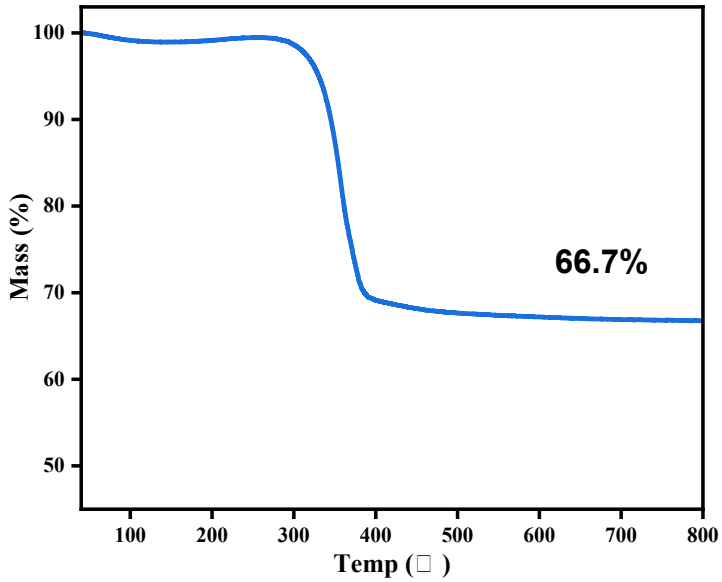

Figure S8. TGA curve (Air atmosphere, from room temperature to 800 ℃) of Ni/AC

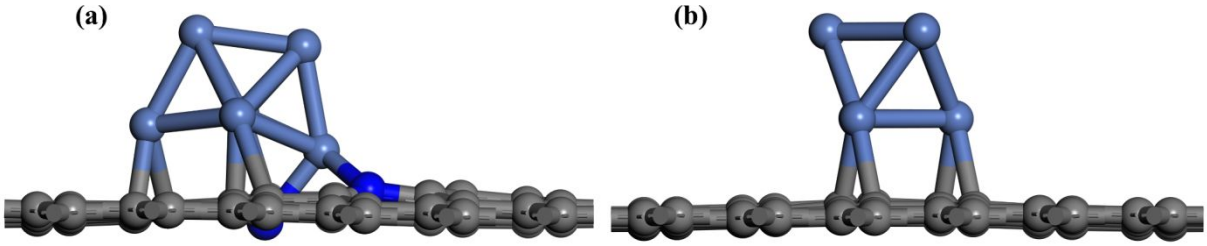

Figure S9. Optimized structures of Ni_6 adsorbed on the NC (a) and C (b) surfaces (side view).

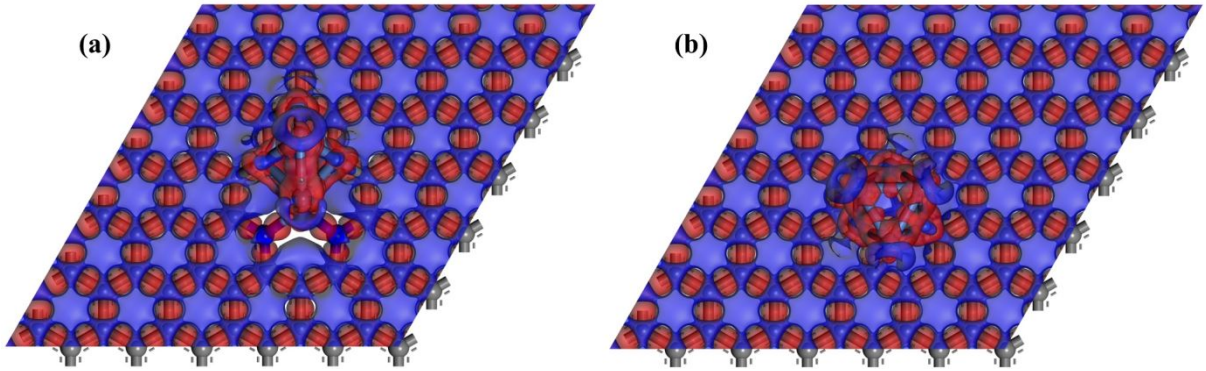

Figure S10. Charge density difference stereograms (top view) of (a) Ni_6/NC and (b)Ni_6/C.

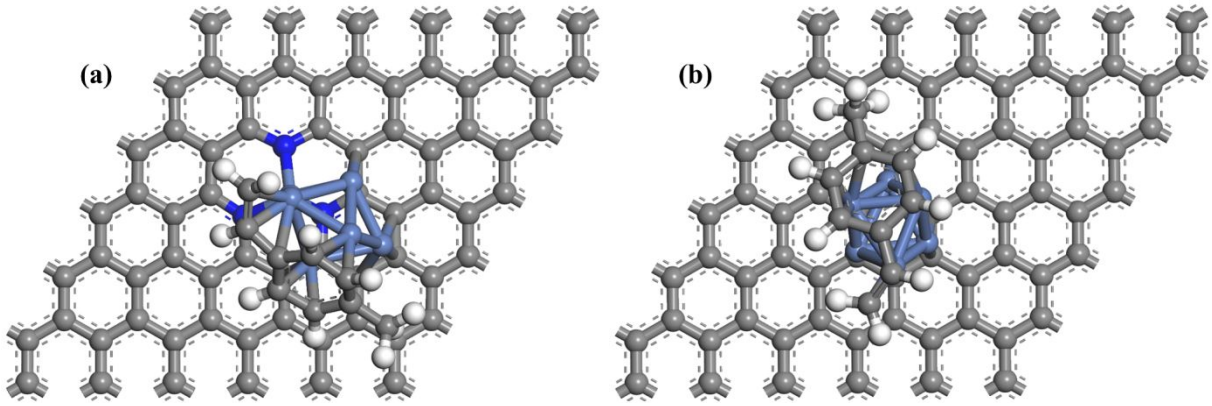

Figure S11. Optimized structures of 4-methylphenylene adsorbed on the Ni_6/NC (a) and Ni_6/C (b) surfaces (top view).

Table S1. Surface element content of materials

Catalyst	C	Ni	O	N
Ni-CQDs/NCNs-400	67.98	5.45	7.51	19.06
Ni-CQDs/NCNs-450	67.90	5.90	7.39	18.82
Ni-CQDs/NCNs-500	68.58	5.53	7.40	18.49
Ni-CQDs/NCNs-550	71.97	5.23	5.52	17.29

Table S2. Ni element content of PR and HPR

	Ni element content C_x (ppm)
PR	0.0407
HPR	0.0493

Detected by ICP-MS.