

Supplementary Information

Magnetron sputtering platinum on nitrogen-doped polypyrrole carbon nanotubes as an efficient and stable cathode for lithium-carbon dioxide batteries

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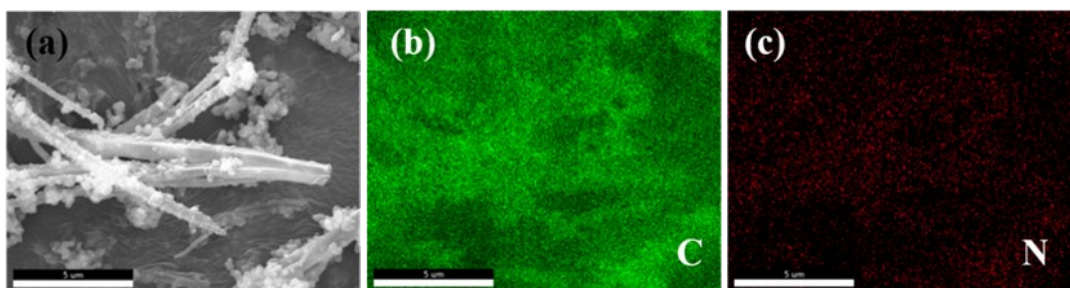


Figure S1 EDX mapping of C and N for the selected area of NPPy-CNTs.

Table S1 Chemical composition from EDS analysis carried out on NPPy-CNTs.

Element	Weight %	Atomic %
C	93.8	94.6
N	6.2	5.4

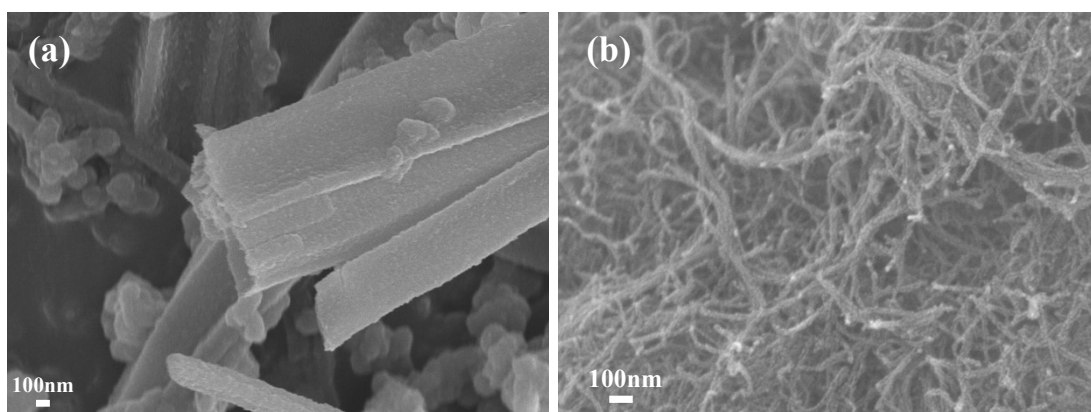


Figure S2 The SEM images of Pt-NPPy-CNTs (a) and commercial CNTs (b).

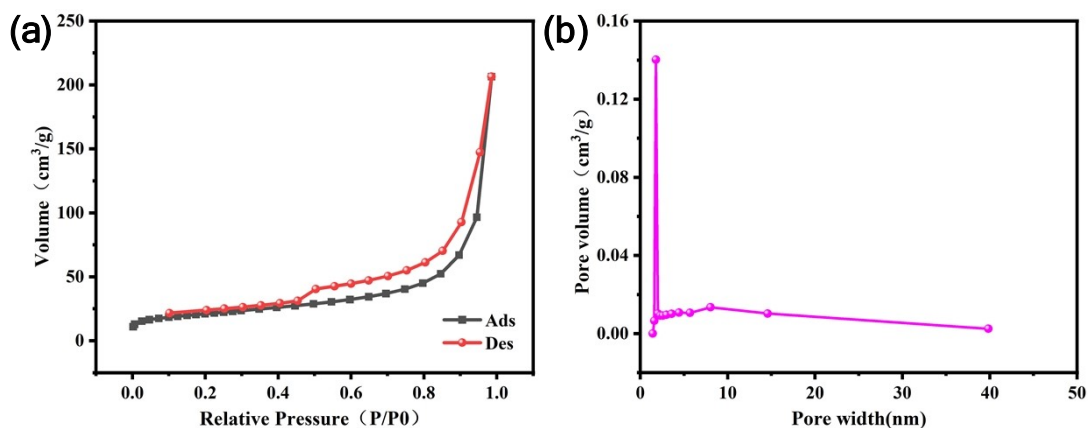


Figure S3 (a) N_2 adsorption and desorption curve of NPPy-CNTs; (b) pore size distribution diagram of NPPy-CNTs.

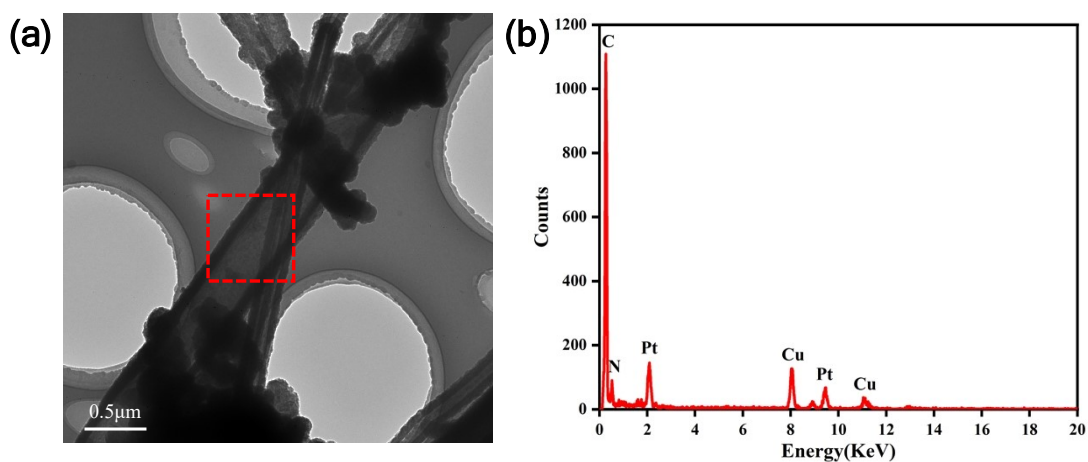


Figure S4 TEM and EDX images of Pt-NPPy-CNTs.

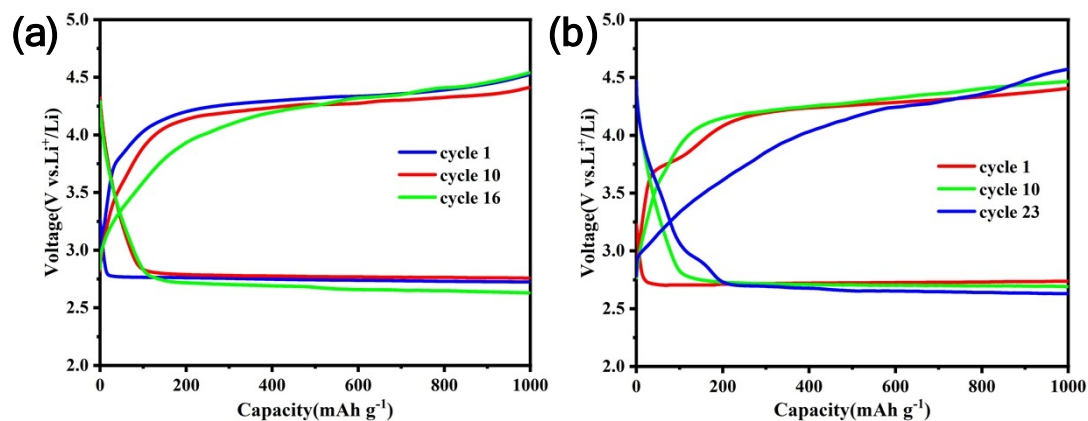


Figure S5 The charge-discharge cycle curves of Li- CO_2 batteries with different catalysts at a current density of 100mA g^{-1} and a cut-off capacity of 1000mAh g^{-1} : (a) Commercial CNTs; (b) NPPy-CNTs.

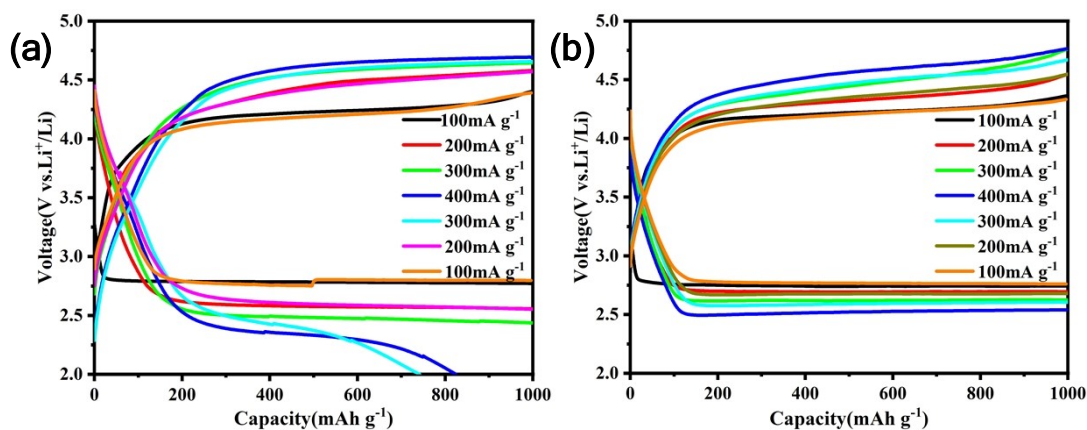


Figure S6 Charge and discharge curves of Li-CO₂ batteries with different catalysts at different current densities and cut-off capacities of 1000mAh g⁻¹: (a) Commercial CNTs; (b) NPPy-CNTs.

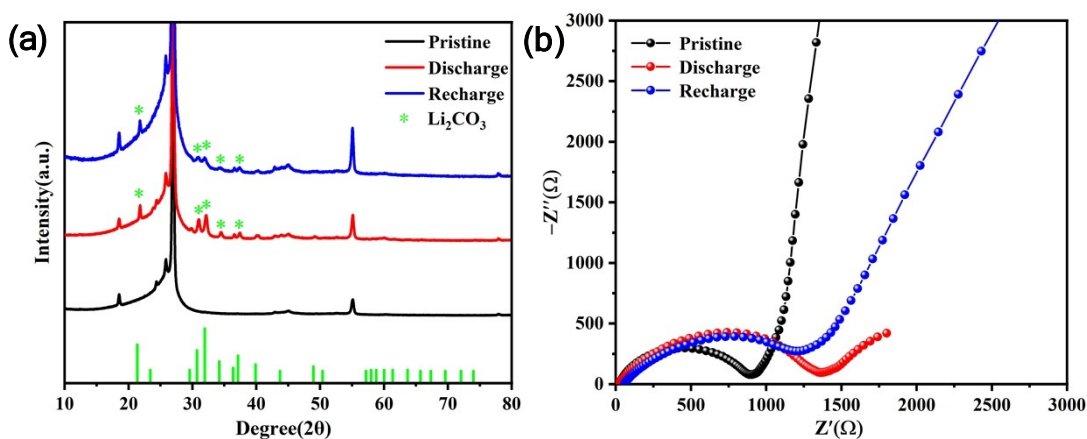


Figure S7 Commercial CNTs cathodes in different charge and discharge stages: (a) Ex-situ XRD pattern; (b) ex-situ EIS map.

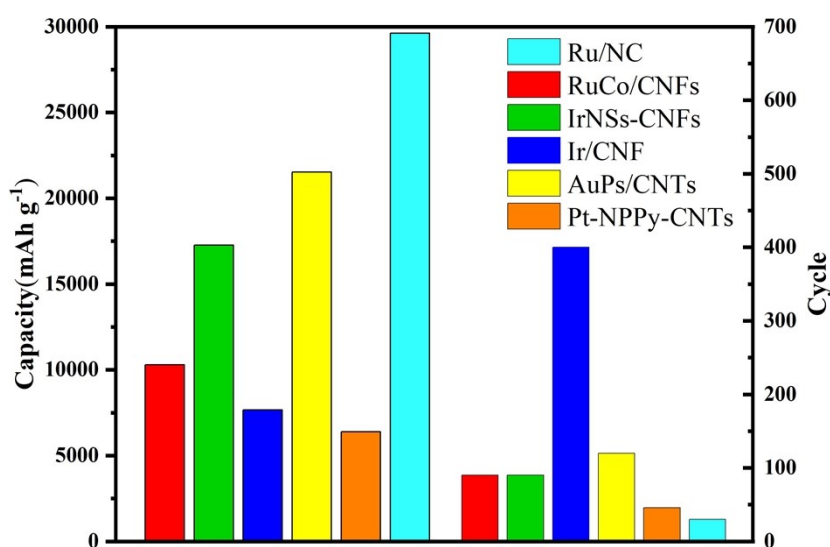


Figure S8 Comparison of discharge specific capacity and cycle performance of different noble metal doped carbon materials as cathode catalyst of Li-CO₂ batteries.¹⁻⁷

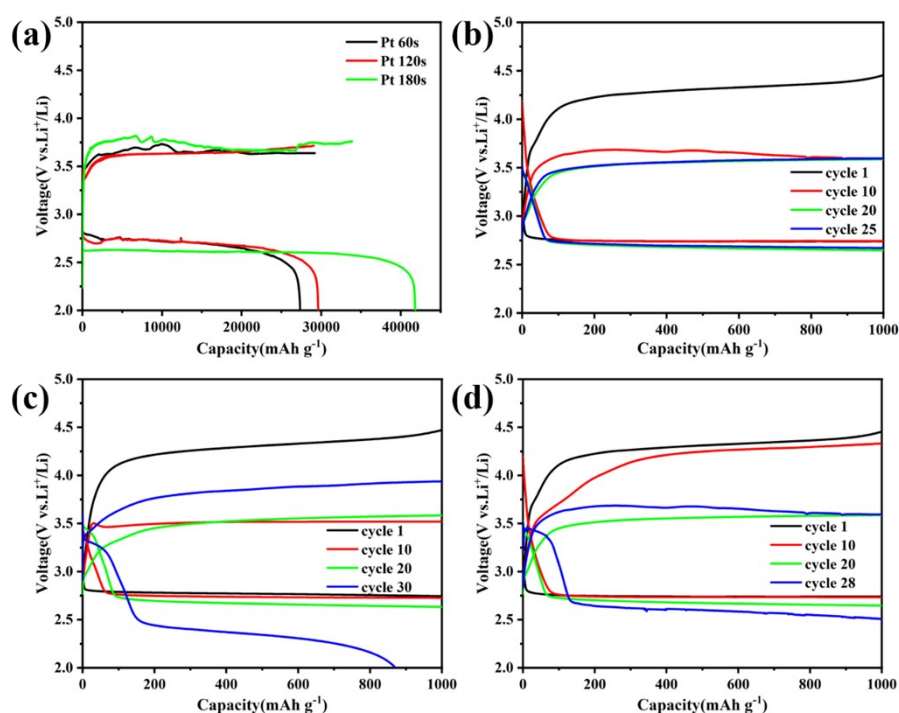


Figure S9 (a) First complete charge-discharge diagram of Pt-NPPy-CNTs with different magnetron sputtering time at 100 mA g^{-1} current density; charge-discharge cycles of Pt-NPPy-CNTs with different magnetron sputtering time at 100 mA g^{-1} current density and 1000 mAh g^{-1} cut-off capacity: (b) 60s; (c) 120s; (d) 180s.

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