COMMUNICATION

Supporting Information

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3D spongy nanofiber structure Fe-NC catalysts built by graphene regulated electro-spinning method

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Experimental characterization: The morphology of the samples was studied by scanning electron microscope (SEM, FE-JSM-6701F, JEOL, Japan),Elemental mapping and high resolution of the samples were characterized by transmission electron microscopy (TEM, JSM-2100, JEOL, Japan).The crystal phase structure of the electrocatalyst was obtained by X-ray diffraction analysis (XRD, D / max-2500, Rigaku, Japan) using CuKα radiation (λ = 1.54056Å) source radiation.The nitrogen adsorption-desorption measurement data of the catalyst were performed on the Quantachrome AUTOSORB-SI instrument, and the data were used to calculate the specific surface area and pore size distribution according to the Brunauer-Emmett-Teller (BET) and t-Plot methods respectively.X-ray photoelectron spectroscopy (XPS) measurement of elements on an X-ray photoelectron spectrometer (XPS, ESCALAB 250, Thermo Fisher Scientific, USA)Use the C 1s peak (284.8eV) as the calibration reference.

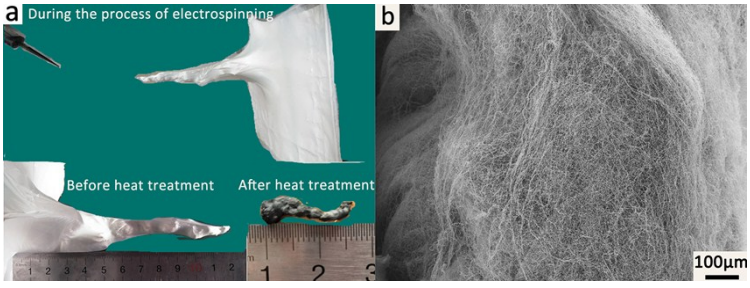

Fig S1. Spindle shape 3D SNS composite and the corresponding catalyst right after calcination at 800 °C (a) and the SEM image of the cross section of the catalyst (b) .

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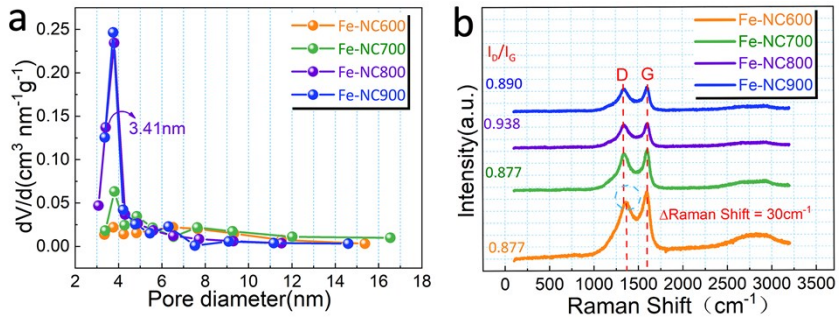

Table S1. The data generalized from nitrogen adsorption–desorption isotherms of different 3D SNS Fe-NC catalyst
Fig S2. (a) pore size distribution of the 3D SNS catalysts and (b) Raman spectra.

Catalysts	Specific Surface Area (m^2/g)	Most probable distribution pore size (nm)	Total volume of pores smaller the 5nm(cm^3)
Fe-NC600	297.1	3.76	0.0624cm^3
Fe-NC700	282.6	3.81	0.14045cm^3
Fe-NC800	487.5	3.80	0.48176cm^3
Fe-NC900	493.5	3.75	0.43984cm^3

Table.S2 Atomic ratios illustrated by high resolution XPS characterizations

Element	Fe-NC600	Fe-NC700	Fe-NC800	Fe-NC900
C1s(Atomic %)	84.7	84.75	83.29	85.98
Fe2p(Atomic %)	1.81	2.29	3.08	2.58
N1s(Atomic %)	6.77	3.95	3.26	3.86
O1s(Atomic %)	6.72	9	10.15	7.25

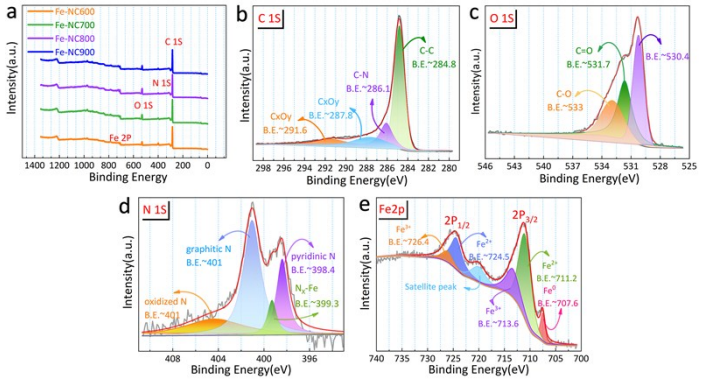

Fig S3. XPS survey spectra of Fe-NC 800 (a) and corresponding high resolution C 1s (b) and O 1s (c) and N 1s (d) and Fe 2p (e)

Table.S3 Active materials contained in 3D SNS Fe-NC catalysts and corresponding ORR performance

	Fe_3C	Fe_2N	Fe_4N	Electron transfer(n)	$E_{1/2}$(Vs.RHE)
Fe-NC 700	√		√	3.9	0.86V
Fe-NC 800	√	√	√	4	0.88V
Fe-NC 900		√	√	3.4	0.86V

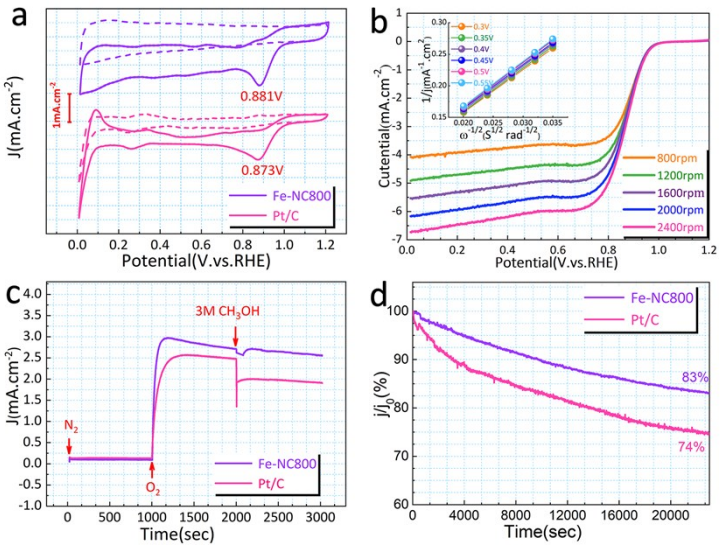

Fig S4. (a)Comparison of CV curves of Fe-NC800 and 20wt% commercial Pt/C in N_2 (dashed line) or O_2 (solid line) saturated 0.1MKOH electrolyte. (b) LSV curves at different rotating speed in O_2 saturated 0.1MKOH electrolyte and corresponding K-L plots of Fe-NC800. (c) Chronoamperometric response upon introduction of 3 M methanol after 1000 sec in O_2- saturated 0.1 M KOH (d) Chronoamperometric response of Fe-NC800 and commercial Pt/C.