Tannic Acid Mediated Synthesis of Dual-heteroatom Doped Hollow Carbon from Metal-Organic Framework for Efficient Oxygen Reduction Reaction

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\textbf{Equation S1}: \( \frac{1}{j} = \frac{1}{j_k} + \frac{1}{B \omega^{0.5}} \)

\textbf{Equation S2}: \( B = 0.62nFC(D)^{2/3}v^{-1/6} \)

where \( j \) is the measured current density, \( j_k \) is the kinetic-limiting current density, \( B \) is the Levich slope, \( \omega \) is the rotation speed, \( n \) is the overall number of electrons transferred in the ORR, \( F \) is Faraday's constant, \( C \) is the bulk concentration of \( O_2 \) in the electrolyte, \( D \) is the diffusion coefficient of \( O_2 \), and \( v \) is the kinematic viscosity of the electrolyte.
Fig. S1 (a) FTIR spectra of ZIF-8, ZIF-8@TA and ZIF-8@TA-BDDA. (b) Schematic illustration on synthetic interaction between boron acid and polyols in TRIS buffer.

Fig. S2 EDS spectrum of NB-HC.
Fig. S3 High-resolution XPS of N1s of (a) N-C and (b) N-HC.

Fig. S4 Cyclic voltammograms for ORR in O$_2$ or N$_2$ saturated 0.1 M KOH at a scan rate of 10 mV s$^{-1}$ of (a) N-C, (b) N-HC, and (c) NB-HC electrode. (d) LSV of NB-HC before and after 10000 cycles at a scan rate of 100 mV s$^{-1}$. 
g-N-B

*O

*OH

*O₂

*H
Fig. S5 Calculation model and optimized structures for the stable adsorbed intermediate products on the N/B-codoped nanocarbon.

Fig. S6 The corresponding band structure and partial density states.