# Supplementary Information

## Nitrified coke wastewater sludge flocs: attractive precursor for N, S dual-doped graphene-like carbon with ultrahigh capacitance and oxygen reduction performance

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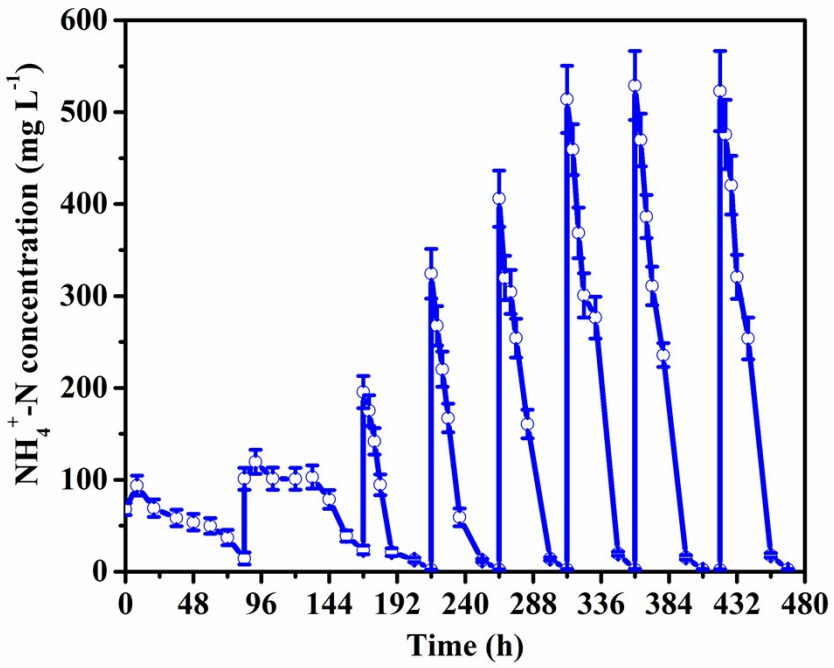


**Fig. S1** The time courses of $NH_4^+$-N concentrations for the coke wastewater sludge acclimated with successive amendments of $NH_4Cl$ in increasing concentrations (ie., 50, 100, 200, 300, 400 and 500 mg $L^{-1}$ $NH_4^+$-N).

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† Electronic supplementary information (ESI) available.

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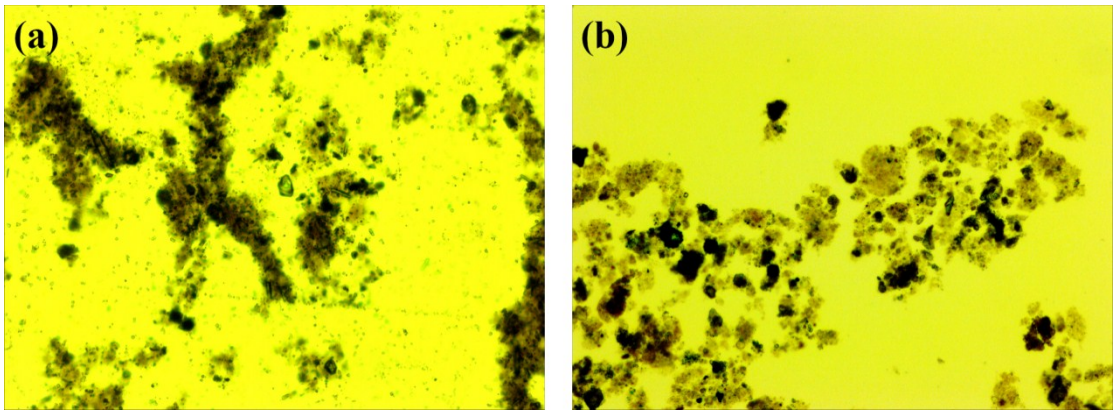


**Fig. S2** The phase contrast microscopy images of (a) the initial coking wastewater sludge flocs and (b) the coking wastewater sludge flocs after acclimation with ammonium.

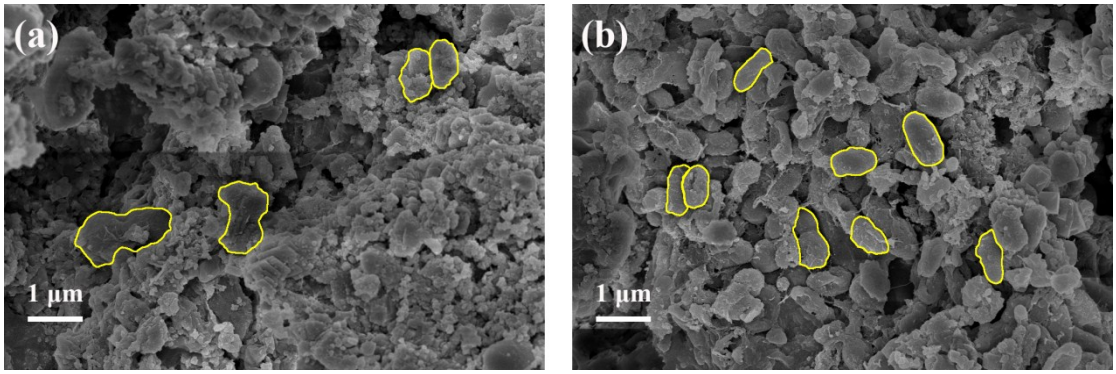


**Fig. S3** The SEM images of (a) the initial coking wastewater sludge flocs and (b) the coking wastewater sludge flocs after acclimation with ammonium.

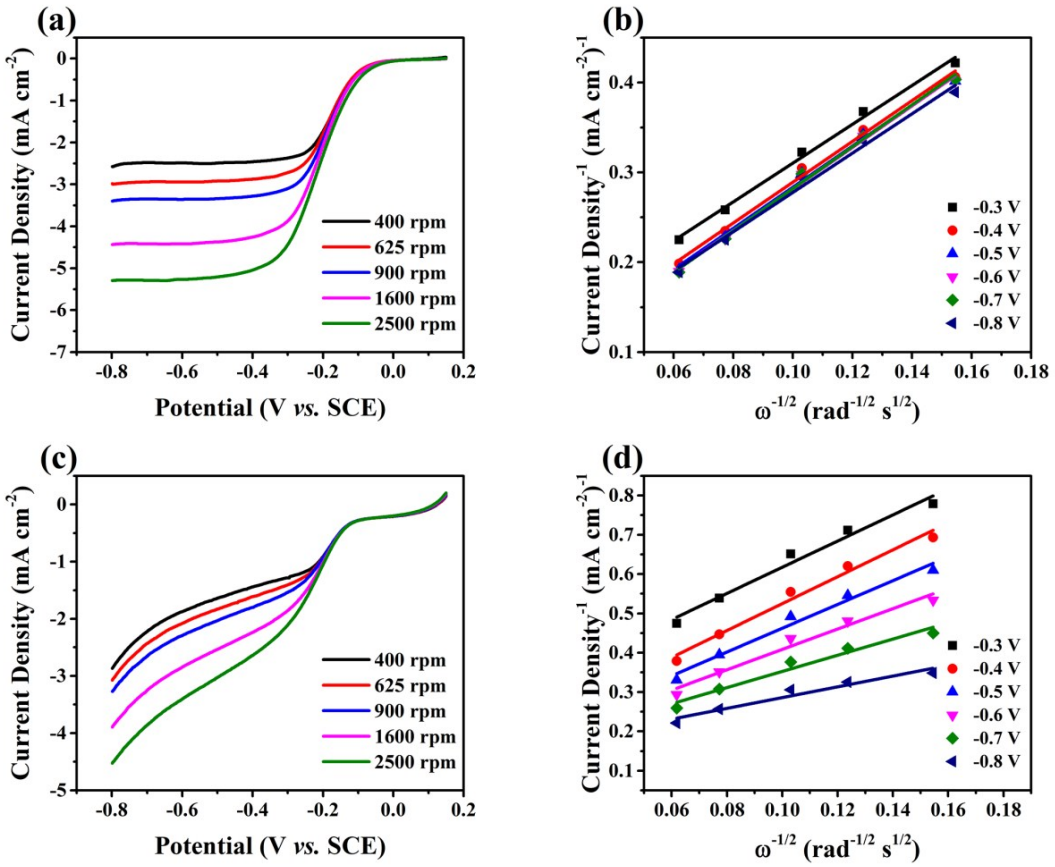


**Fig. S4** RDE voltammograms recorded for the Pt/C (a) and SFC (c) electrodes at different rotation rates; (d) Koutecky - Levich plots of $J^{-1}$ against $\omega^{-1/2}$ for the Pt/C (b) and SFC (d) electrodes at different potentials.

**Table S1** The relative elemental composition (in unit of atomic percent) determined by EDS and XPS.

| Sample | Measurement method | C (at%) | N (at%) | O (at%) | S (at%) | P (at%) | Fe (at%) | Si (at%) | Ca (at%) |
|---|---|---|---|---|---|---|---|---|---|
| SF | EDS | 50.45 | 8.01 | 32.22 | 2.29 | 2.08 | 1.13 | 1.25 | 2.57 |
| NSF | EDS | 44.64 | 10.25 | 34.86 | 4.51 | 1.25 | 1.94 | 0.64 | 1.91 |
| SFC | EDS | 79.07 | 2.54 | 14.73 | 1.46 | n.d. | n.d. | 1.38 | 0.82 |
| | XPS | 79.52 | 3.09 | 14.02 | 1.71 | n.d. | n.d. | 1.02 | 0.64 |
| NSFC | EDS | 78.73 | 7.60 | 12.27 | 2.40 | n.d. | n.d. | n.d. | n.d. |
| | XPS | 79.03 | 7.43 | 10.12 | 3.42 | n.d. | n.d. | n.d. | n.d. |

SF: the initial (coking wastewater) sludge flocs; NSF: the nitrifying (coking wastewater) sludge flocs; SFC: carbon derived from SF; NSFC: carbon derived from NSF; n.d.: not detected.