

Supporting Information

Nonmetallic BN Embedded Graphitic Carbon Catalyst for Oxidative Dehydrogenation of Ethylbenzene

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Table S1 Results of blank experiment over quartz sand in ODH reaction.

Temperature (°C)	EB Conv. (%)	ST Select. (%)	CO _x Select. (%)
356	0	-	-
377	0.2	100	0
397	0.3	100	0
418	0.5	100	0
438	0.7	100	0
458	1.1	100	0

Reaction condition: quartz sand, 200 mg, EB=2.8%, O₂/EB=1, N₂ as balance.

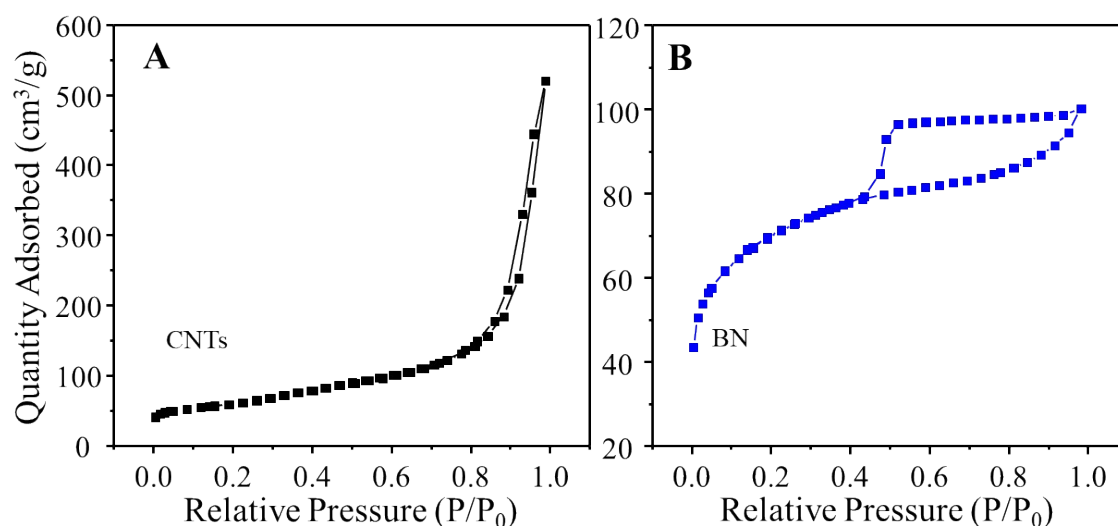


Figure S1 N₂ sorption isotherms of CNTs and BN.

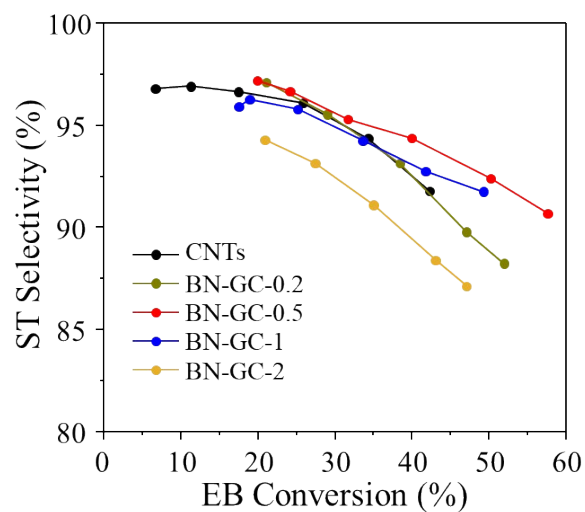


Figure S2 Conversion-selectivity profiles of BN-GC catalysts with different B content. Reaction condition: 50 mg, EB=2.8%, $O_2/EB=1$, N_2 as balance.

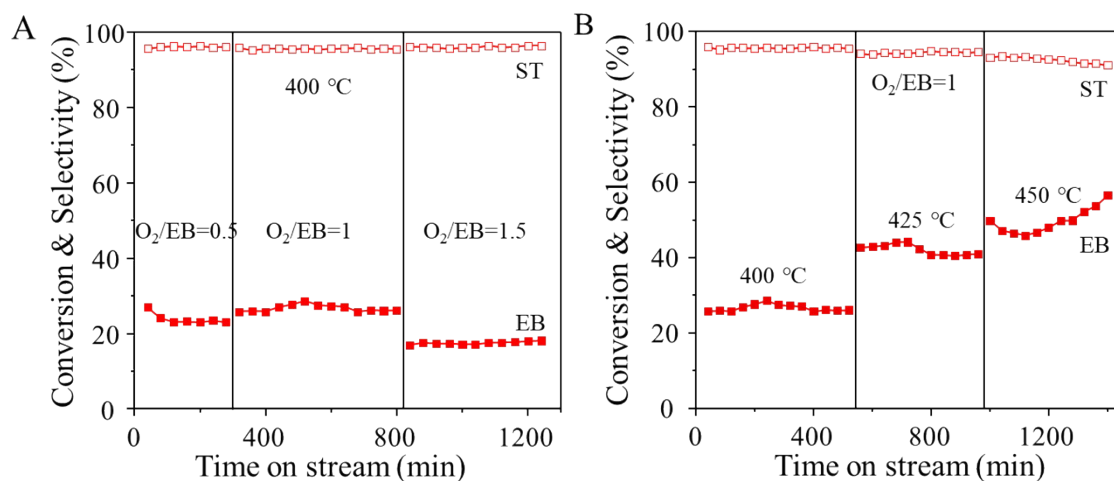


Figure S3 Optimization of the reaction conditions under different ratio of O_2/EB and temperature. Reaction condition: 50 mg, EB=2.8%, N_2 as balance.

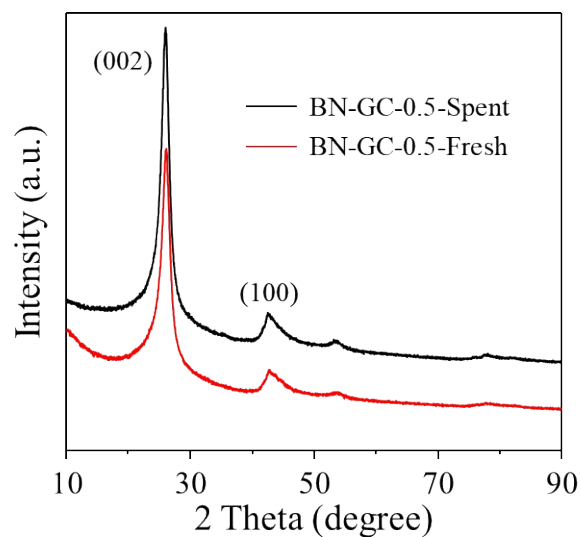


Figure S4 XRD patterns of fresh and spent BN-GC-0.5.

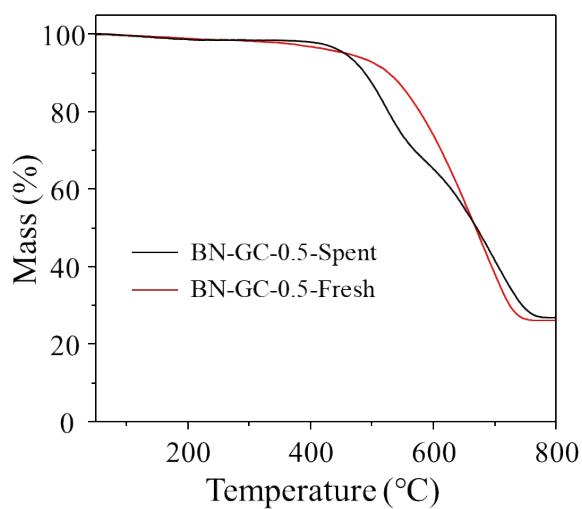


Figure S5 Thermogravimetry analysis of fresh and spent BN-GC-0.5.

Table S2. Chemical properties and deconvolution of O 1s for fresh and spent BN-GC-0.5, CNTs catalysts.

Catalysts	Element (at%)				O groups/Oxygen (%)				Total O _{groups} (%)	
	B	C	N	O	C=O	B-O	O=C-O	C-O	C=O	B-O
BN-GC-0.5-Fresh	10.0	72.8	9.9	7.0	17.7	27.3	37.4	17.6	1.24	1.91
BN-GC-0.5-Spent	9.4	72.4	8.6	9.3	17.8	29.0	18.1	35.0	1.66	2.70
CNTs-Fresh	-	97.9	-	1.9	10.8	-	50.7	38.4	0.21	-
CNTs-Spent	-	97.8	-	2.0	16.8	-	37.2	46.0	0.34	-

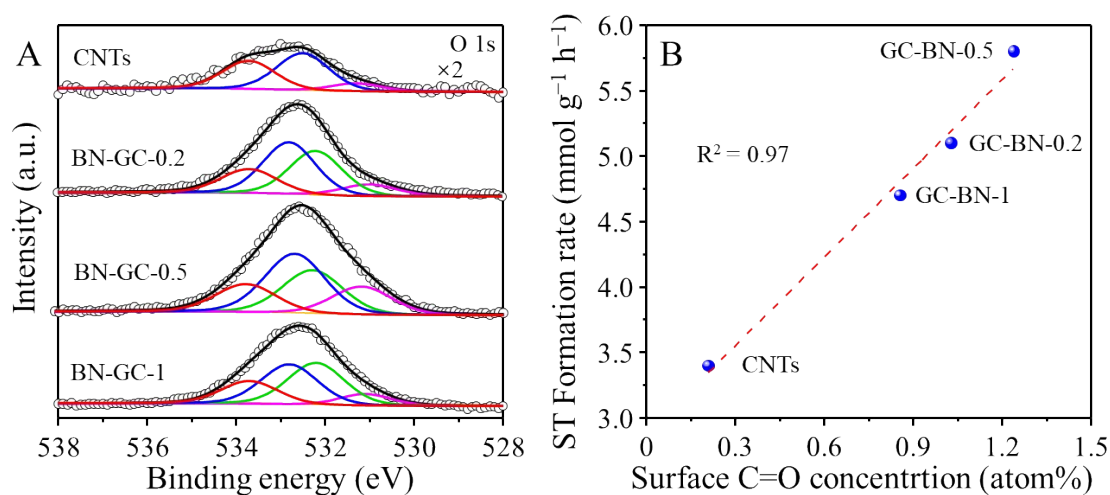


Figure S6 (A) Deconvolution of O 1s and (B) plot for the concentration of C=O against the ST formation rates.

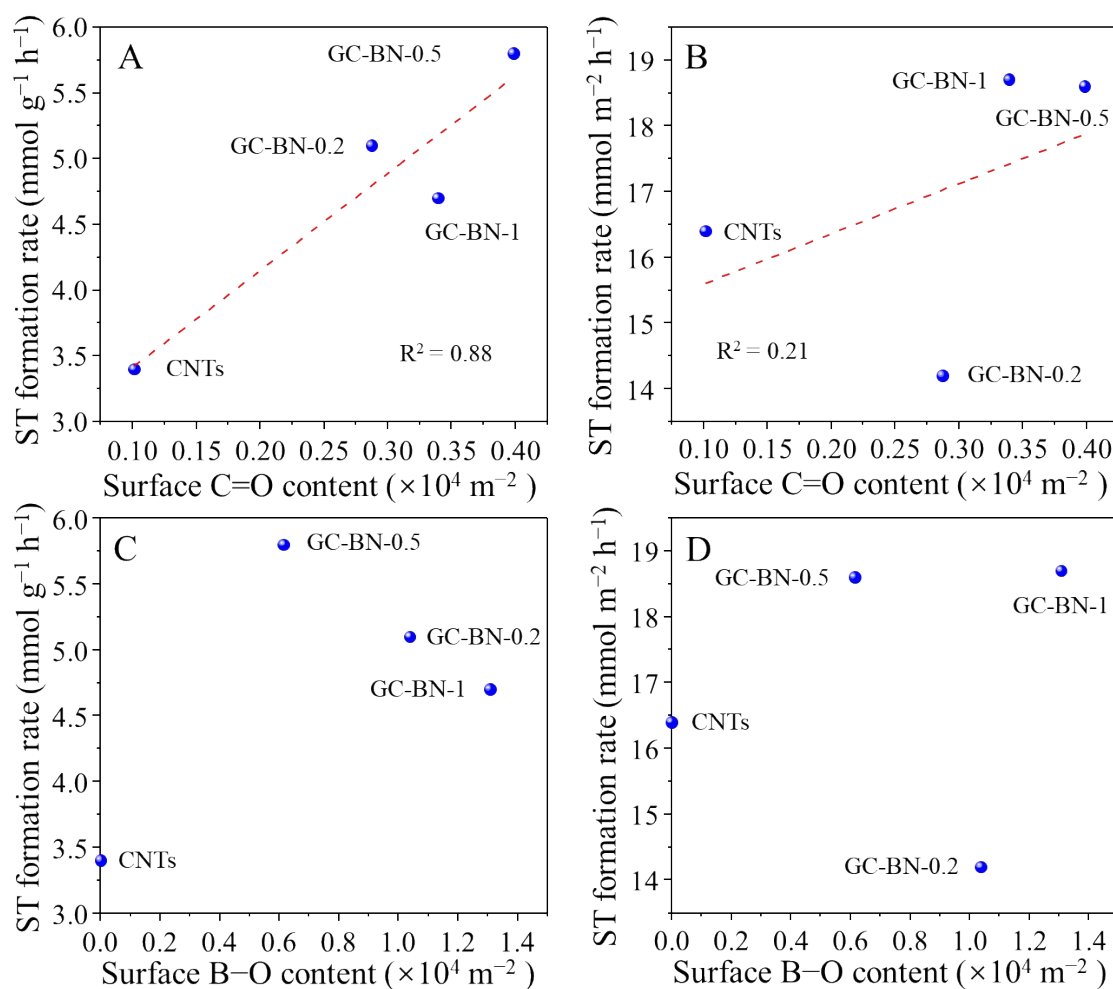


Figure S7 Correlation of the reaction rate (based on mass and surface area) against the amount of C=O and B-O groups per surface area.

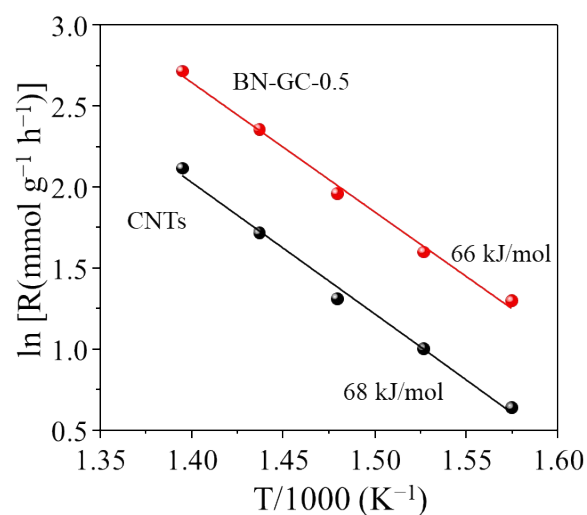


Figure S8 Activation energy of BN-GC-0.5 and CNTs. Reaction condition: 360-440 °C, 50 mg, EB=2.8%, O₂/EB=1, N₂ as balance. Keep EB conversion below 10% by adjusting space velocity.

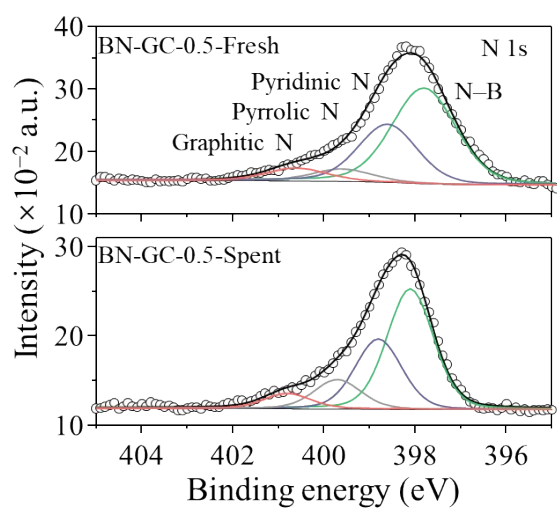


Figure S9 Deconvolution of N 1s spectra of fresh and spent BN-GC-0.5.

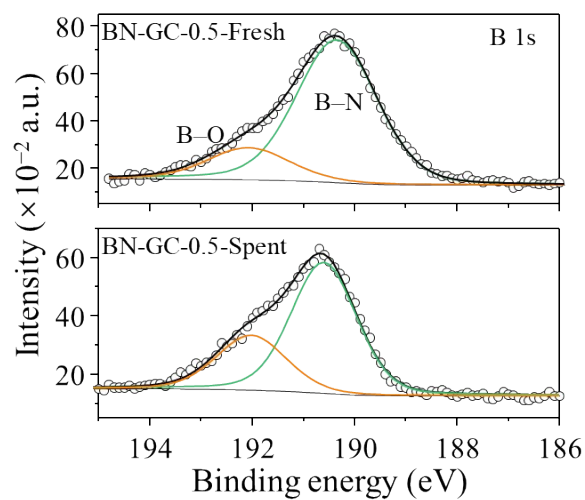


Figure S10 Deconvolution of B 1s spectra of fresh and spent BN-GC-0.5.

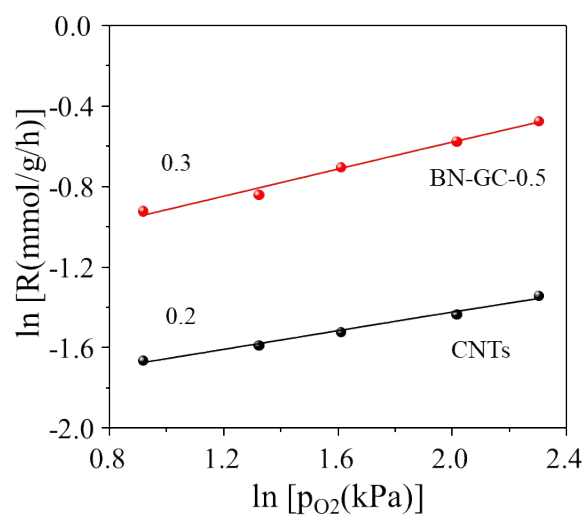


Figure S11 Reaction order of O_2 over BN-GC-0.5 and CNTs. Reaction condition: 400 °C, 50 mg, EB=2.8%, N_2 as balance. Keep EB conversion below 10% by adjusting space velocity.