Supplementary Information

Taming electronic properties of boron nitride nanosheets as metal-free catalysts for aerobic oxidative desulfurization of fuels

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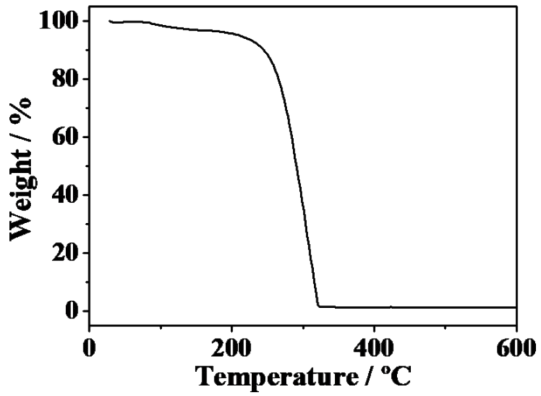

Figure S1. TGA curve of [C16mim]Cl.

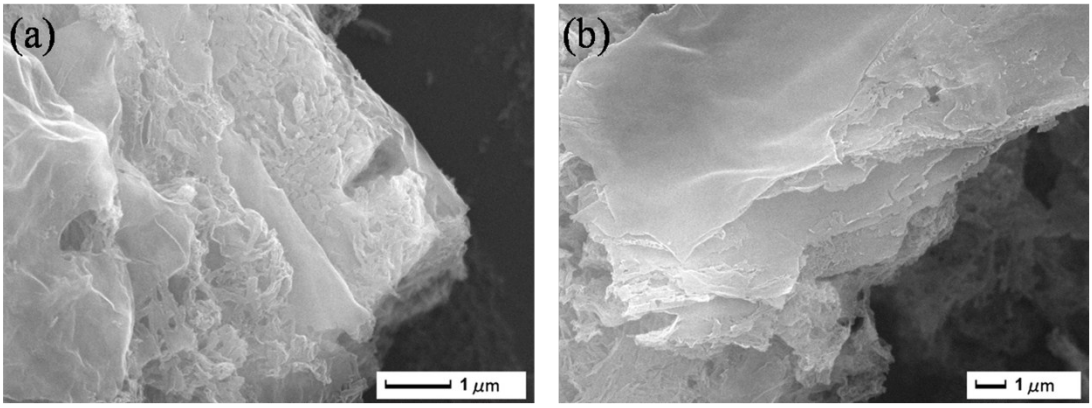

Figure S2. SEM images of h-BN.

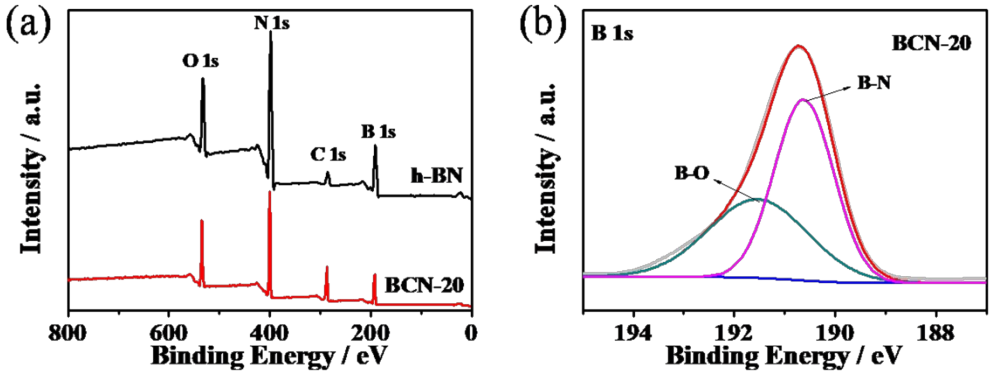

Figure S3. (a) XPS survey spectra of h-BN and BCN-20; (b) B 1s core-level spectrum of BCN-20.

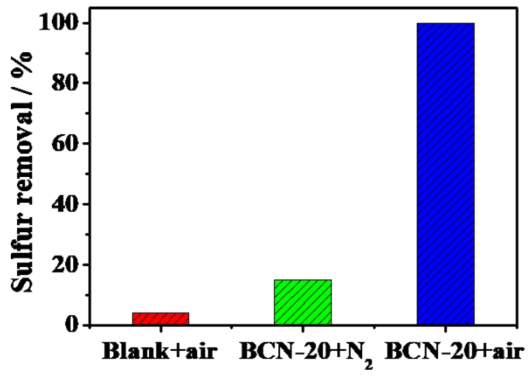

Figure S4. Catalytic oxidation of DBT under different conditions. Experiment conditions: *m* (catalyst) = 70 mg, *V* (model oil) = 20 mL, *v* (gas) = 100 mL·min^{-1}, *T* = 100 °C.

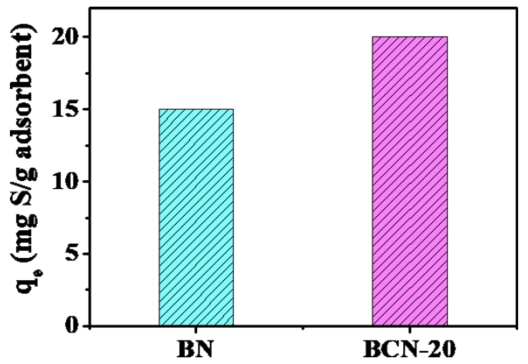

Figure S5. The adsorption capacity of different samples. Experiment conditions: *m* (absorbent) = 70 mg, *V* (model oil) = 20 mL, *T* = 25 °C, C_0 (oil) = 200 ppm.

The experimental procedure for the determination of adsorption capacity is as follows: 70 mg of adsorbent and 20 mL model oil were added into a 50mL conical flask and then fixed in shaker equipment with a water bath maintained at 25 °C. The residual sulfur concentration after the adsorption was analyzed by a gas chromatograph instrument (GC Agilent-7890A, equipped with a flame ionization detector (FID) and HP-5 column (30 m long×0.32 mm inner diameter (id) 0.25 μm film thickness).

The adsorbed capacity (q_e) of the sulfur compounds at equilibrium (mg g^{-1}) was calculated by the following equation:

$$q_e = \frac{(C_0 - C_e)V}{m}$$

where C_0 and C_e (mg L^{-1}) were the initial and equilibrium sulfur concentration, respectively, *V* (L) was the volume of model oil, and *m* (g) was the quality of adsorbent.

The thermodynamic studies showed that the adsorption is an exothermic process, which means that the adsorption capacity will decrease with the increase of adsorption temperature[1]. Therefore, 25 °C was favorable for the adsorptive experiment.

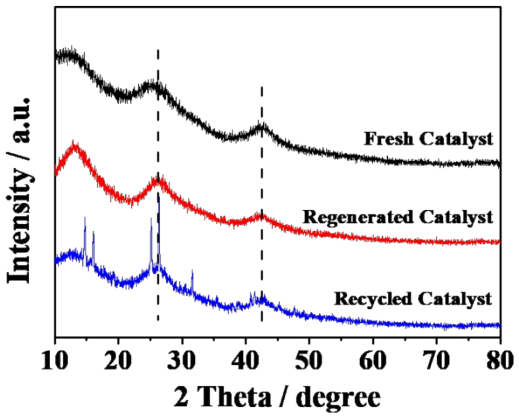

Figure S6. XRD patterns of fresh, recycled and regenerated BCN-x.

Notes and References

1. G. Miao, F. Y. Ye, L. M. Wu, X. L. Ren, J. Xiao, Z. Li and H. H. Wang, *J. Hazard. Mater.*, 2015, **300**, 426-432.