

Electronic Supplementary Information (ESI) for:

Low-temperature activation of carbon black by selective photocatalytic oxidation

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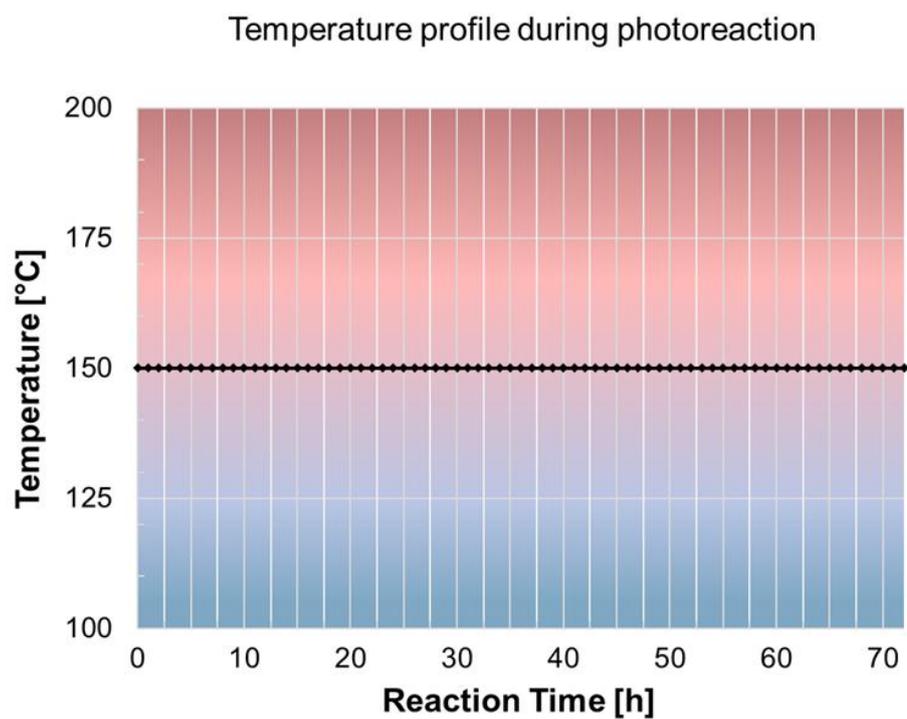


Fig. S1 Temperature profile during a standard 72 h photocatalytic carbon black oxidation, showing a constant temperature of 150 °C over the entire reaction period.

Table S1 Gas specifications

Gas	Purity (vol%)
O ₂	99.995%
NO (5% in He)	99.9% (NO)
N ₂	99.999%
H ₂	99.999%

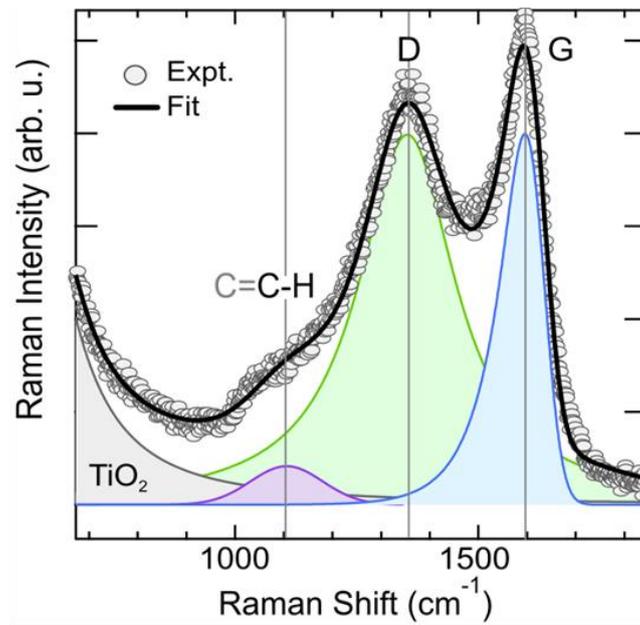


Fig. S2 Deconvolution fitting of Raman spectrum of pristine CB in close proximity of TiO_2 . The D band is described by a Lorentzian oscillator in combination with a smaller mode on its low-energy shoulder at 1100 cm^{-1} , due to aromatic C-H vibrations.¹ The G band is fitted with an “exponentially modified Gaussian” function, an asymmetric lineshape which best accounts for the amorphous carbon band present near 1530 cm^{-1} . Below 1000 cm^{-1} a steep rise is recorded as a result of anatase TiO_2 vibrations.

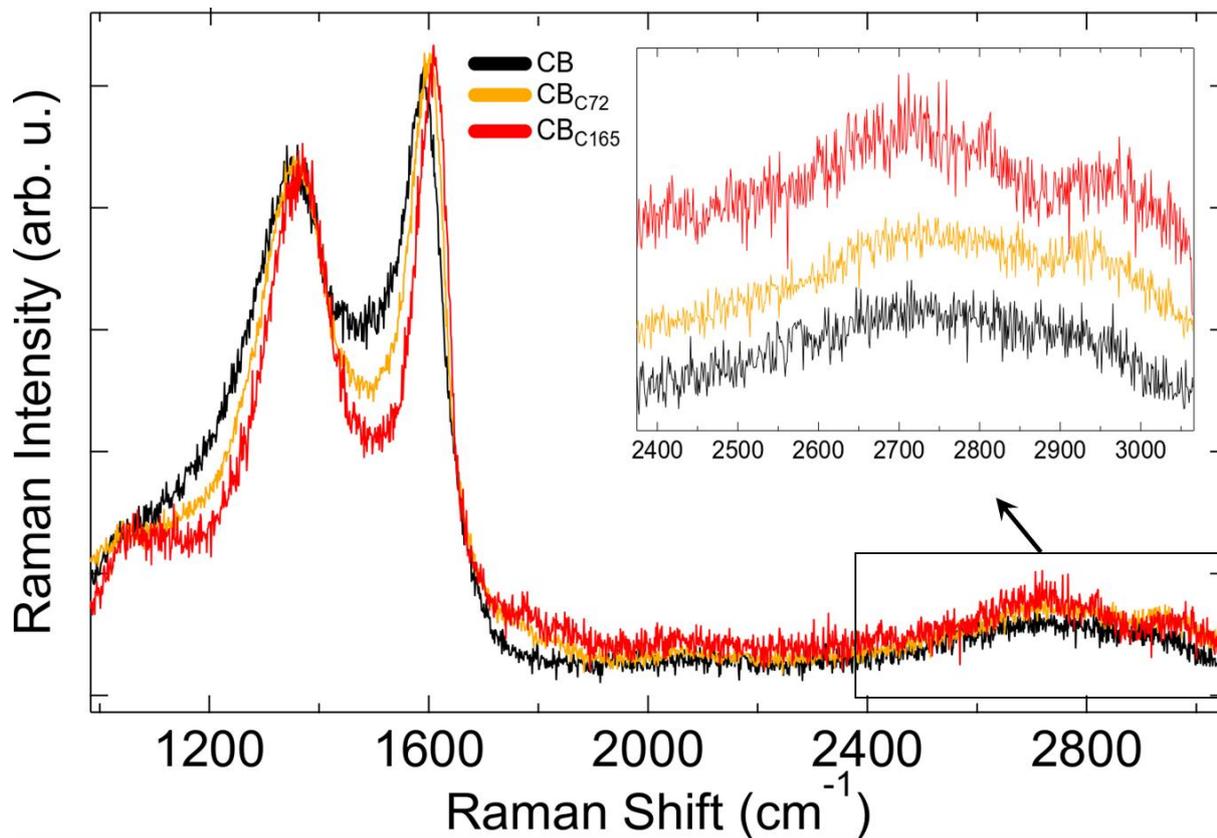


Fig. S3 Normalized Raman spectra of CB, CB_{C72} and CB_{C165}, showing magnified spectra of two weak, high-wavenumber bands, namely, the 2D band around 2720 cm⁻¹ and the sp³ C-H band around 2950 cm⁻¹. The 2D band is a second-order band with double resonant origin, characteristic of graphene and graphitic materials, and arises from multiple small defect activated bands in the range from 2600 cm⁻¹ to 2850 cm⁻¹.² This 2D band also becomes sharper as a result of contact photo-oxidation, supporting the notion of enhanced structural order. The small band in the range 2850-3050 cm⁻¹ is ascribed to sp³ C-H stretching vibrations.³ Furthermore, the D band shoulder at 1100 cm⁻¹ attributed to aromatic C-H bonding increases with prolonged UV-illumination, confirming a more ordered network of aromatic carbon rings upon photo-oxidation.

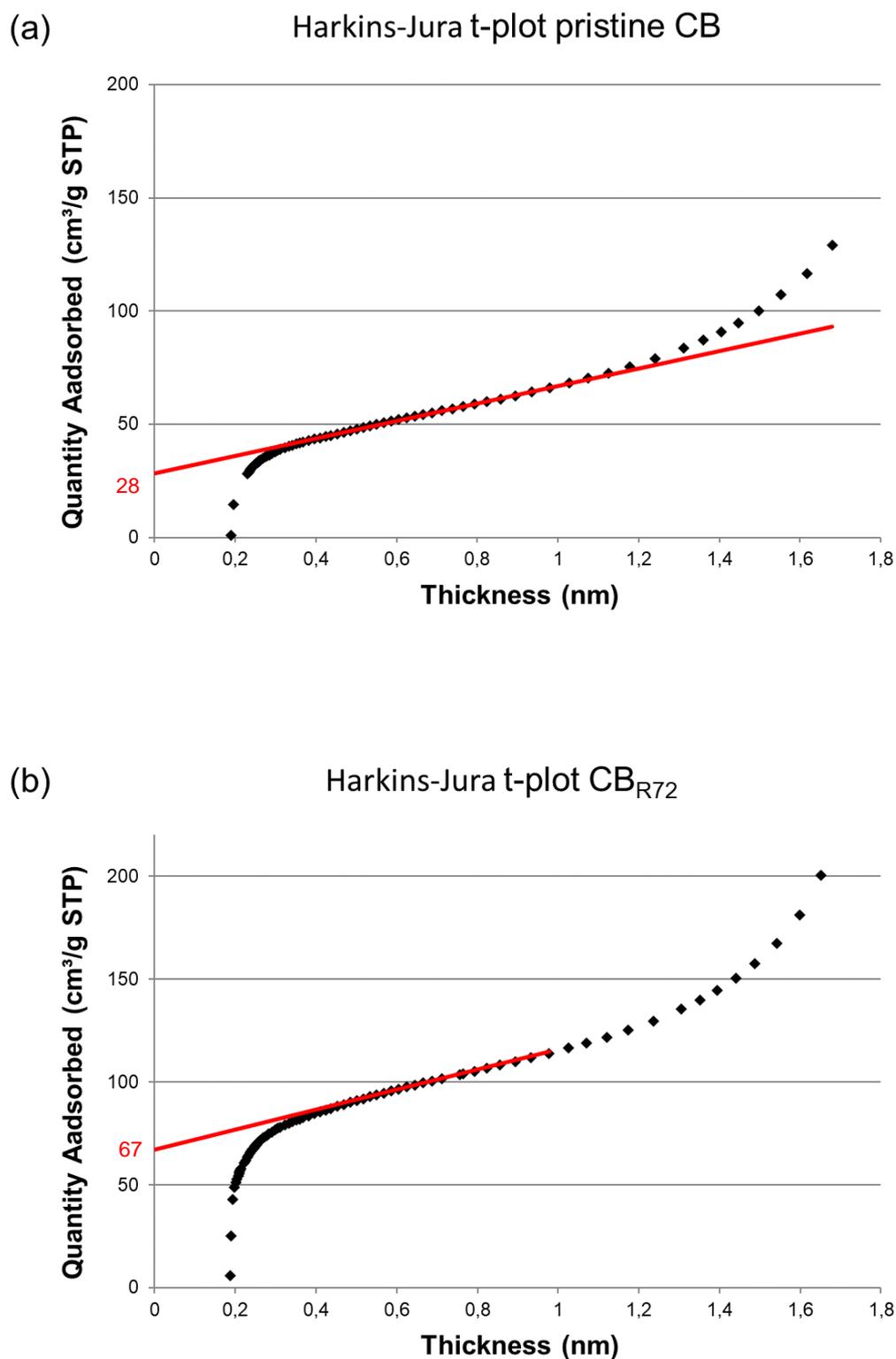


Fig. S4 Harkins-Jura t-plot nitrogen adsorption isotherms, which show the microporous volume by the y-intercept of the trendline. (a) Pristine CB. (b) CB_{R72}.

References

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- 2 A. Kaniyoor and S. Ramaprabhu, *AIP Advances*, 2012, **2**, 032183.
- 3 K. Ushizawa, M. Nishitani-Gamo, Y. Kikuchi, I. Sakaguchi, Y. Sato and T. Ando, *Physical Review B*, 1999, **60**, R5165-R5168.