

Supporting Information

Evaluating the Surface Chemistry of Black Phosphorus during Ambient Degradation

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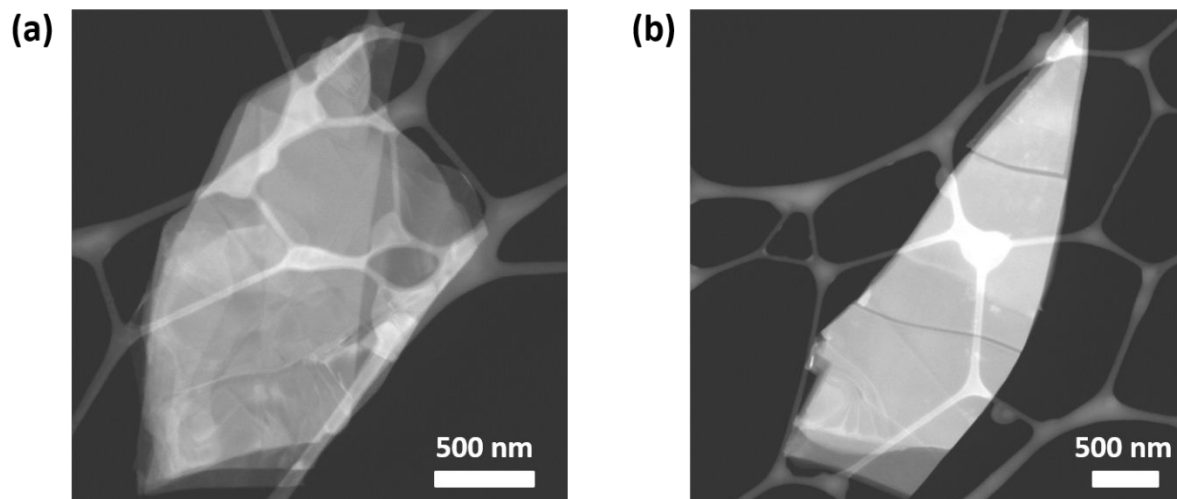


Figure S1: STEM analysis of liquid exfoliated few-layer BP.

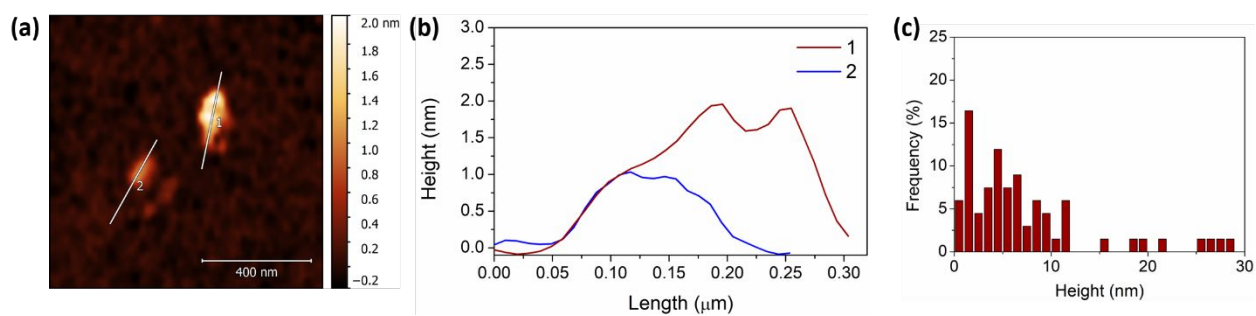


Figure S2: AFM analysis of exfoliated BP showing a) mono- and bilayer BP flakes and b) height profiles. c) The histogram gives an indication of the flake thicknesses of a sample used for degradation analysis.

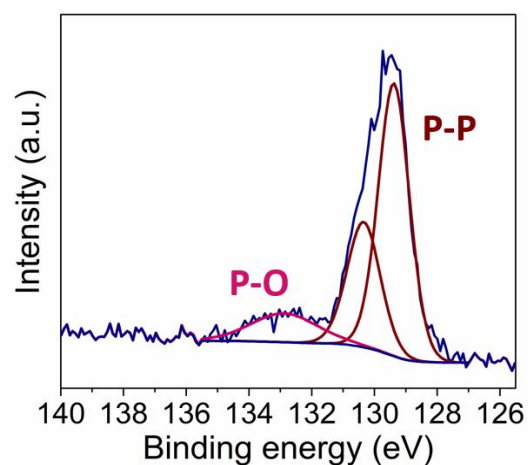


Figure S3: XPS P 2p core level displays a reduction in the oxide shoulder to 13 % after purging the solvent with Ar gas before exfoliation, suggesting dissolved gases cause oxidation during the exfoliation stage.

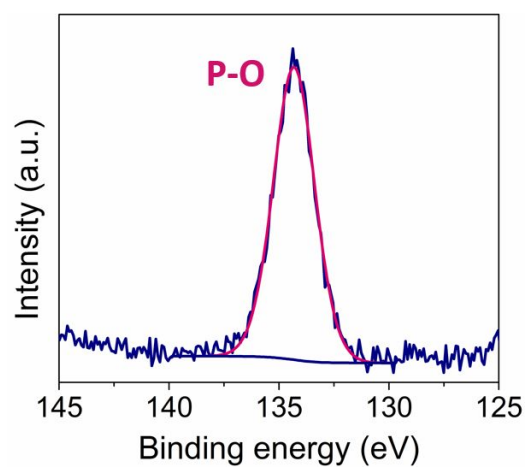


Figure S4: XPS analysis of the final product of degradation.

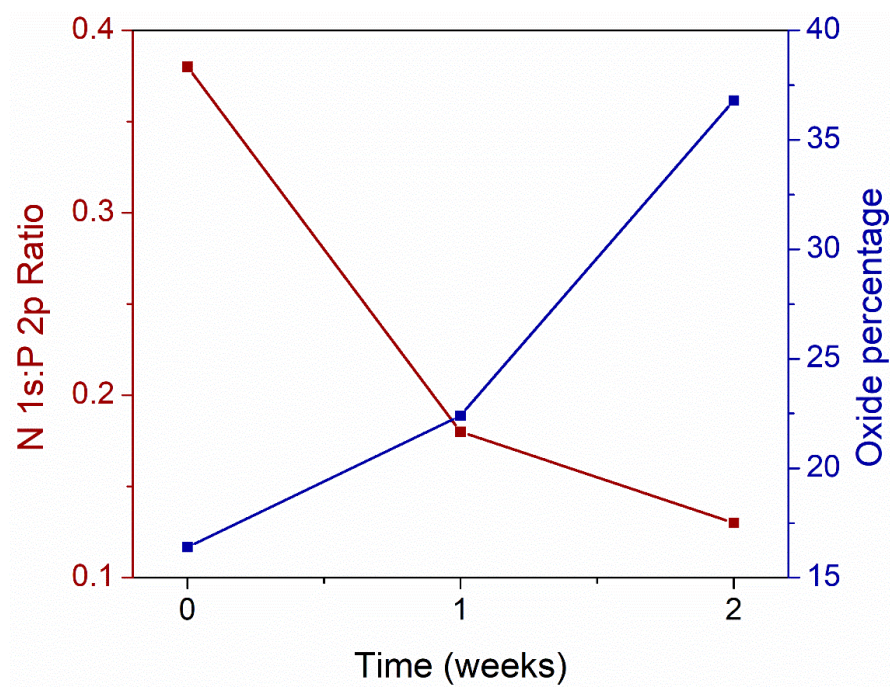


Figure S5: N 1s:P 2p ratios and comparison to the percentage of PO_x of the P 2p core level during ambient exposure.

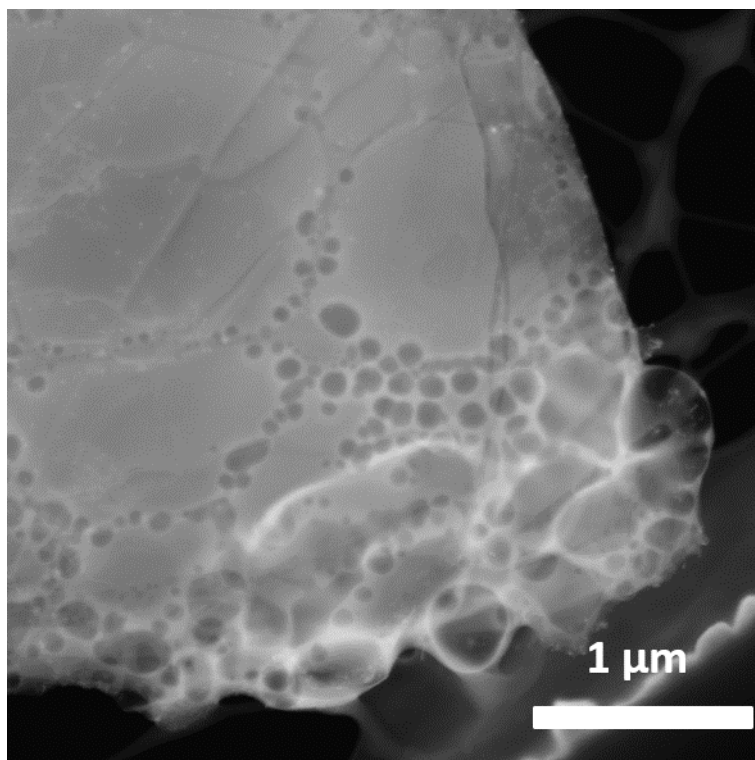


Figure S6: High resolution STEM analysis of few-layer BP exposed to ambient conditions for 1 week. Surface protrusions as a result of oxidation are visible.

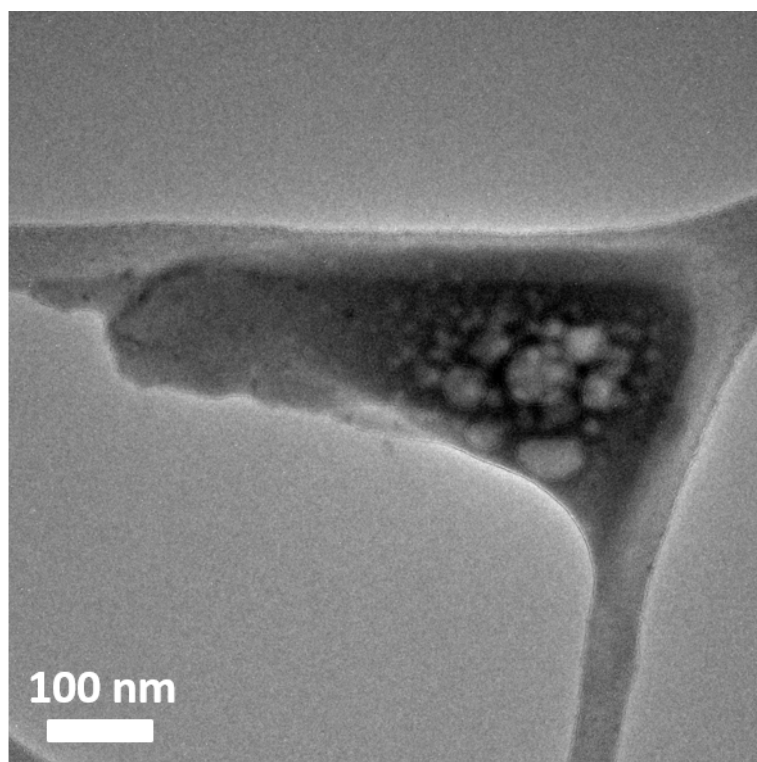


Figure S7: TEM analysis of BP exposed to ambient conditions for 1 week.

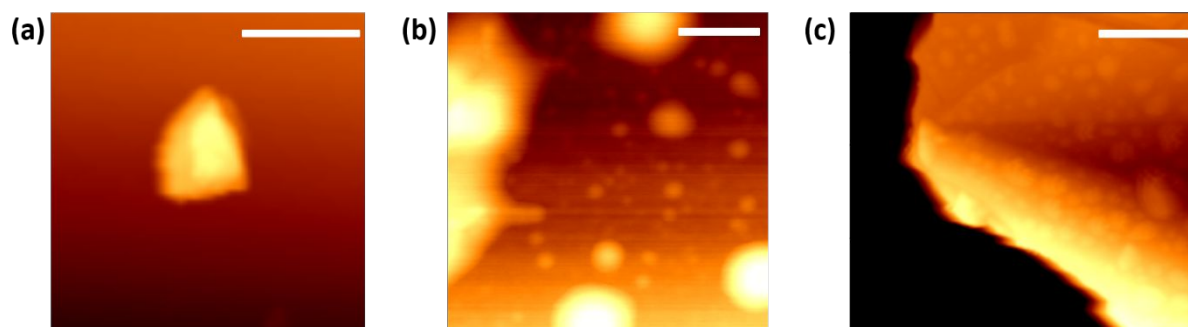


Figure S8: AFM analysis of (a) freshly exfoliated few-layer BP, (b) bulk BP exposed to ambient conditions for 1 week and (c) few-layer BP exposed to ambient conditions for a week. The scale bars correspond to 0.5, 0.25 and 1 micron.

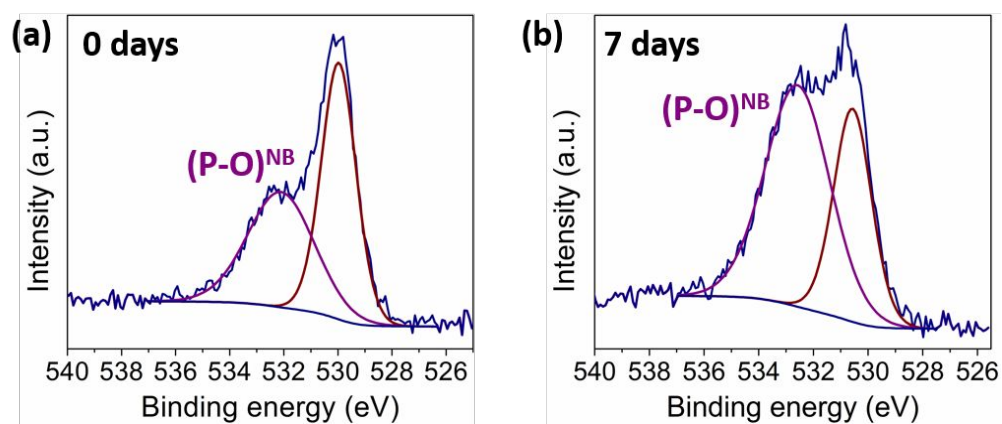


Figure S9: XPS O 1s core levels for (a) non-exposed bulk BP and (b) exposed for 1 week to ambient conditions. The increase in the non-bridging P-O component suggests oxidation of the surface but absence of a P-O-P component at 535.5 eV indicates bulk BP does not oxidise as significantly as few-layer BP.