Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Size-Controlled Growth of Cubic Boron Phosphide Nanocrystals

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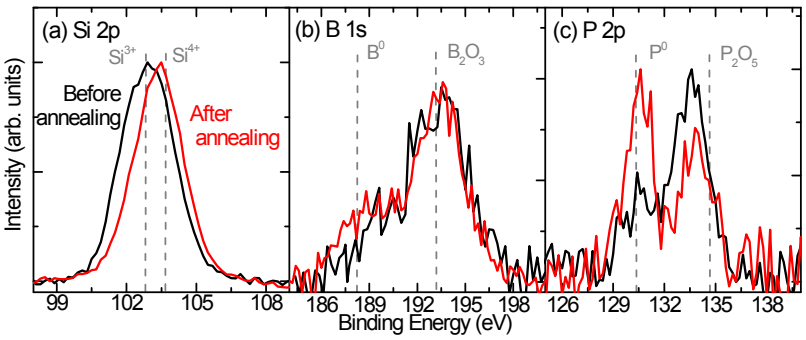

Figure S1. XPS spectra of film sample (BP8) before and after annealing. (a) Si 2p (b) B 1s (c) P 2p.

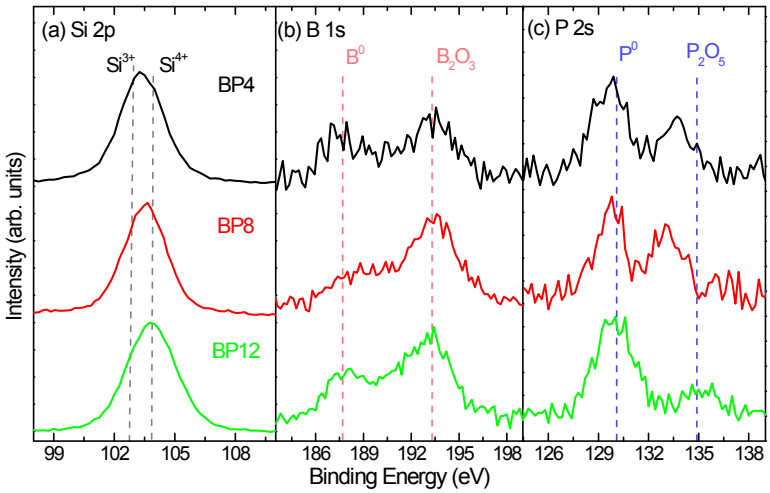

Figure S2. XPS spectra of film samples (BP4, BP8 and BP12) after annealing, (a) Si 2p (b) B 1s (c) P2p.

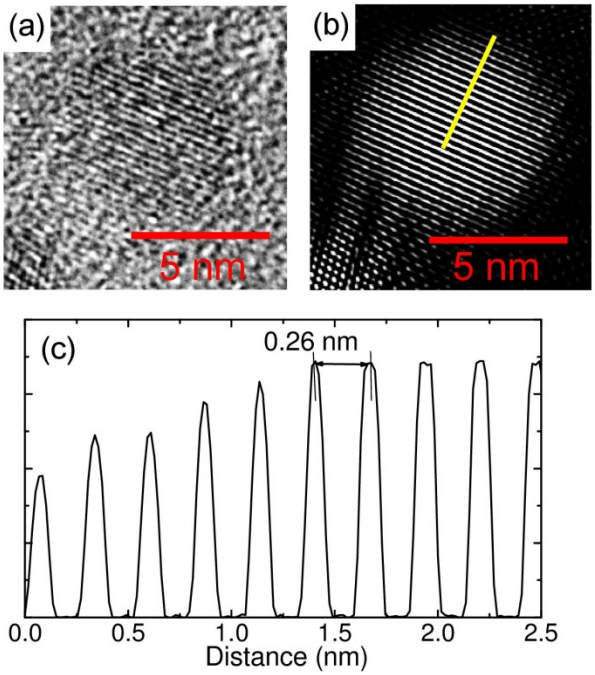

Figure S3. (a) High resolution TEM image of a BP nanocrystal. (b) Inverse fast Fourier transform image after FFT and selecting spots corresponding to {111} planes of BP crystal in (a). (c) Intensity profile along the yellow line in (b).

Size-estimation of BP4 from electron diffraction patterns

The size of nanocrystals in BP4 is estimated from the width of the electron diffraction peak by employing the Scherrer equation:

$$D = \frac{K\lambda}{\beta \cos\theta},$$

where, D is the diameter of nanocrystals, K is a constant determined by particle morphology, β is the full width at half-maximum (FWHM) of the diffraction peak, and θ is the center position of the peak. Under the assumption that K, λ and θ are the same between BP4 and BP8, the ratio of the diameter (D_{BP4}/D_{BP8}) is equal to that of the FWHM (β_{BP4}/β_{BP8}) as,

$$\frac{D_{BP4}}{D_{BP8}} = \frac{\frac{K\lambda}{\beta_{BP4}\cos\theta}}{\frac{K\lambda}{\beta_{BP8}\cos\theta}} = \frac{\beta_{BP8}}{\beta_{BP4}}.$$

By using the diameter of BP8 obtained from TEM images (4.3 nm), the diameter of BP4 is estimated to be 2.2

nm.

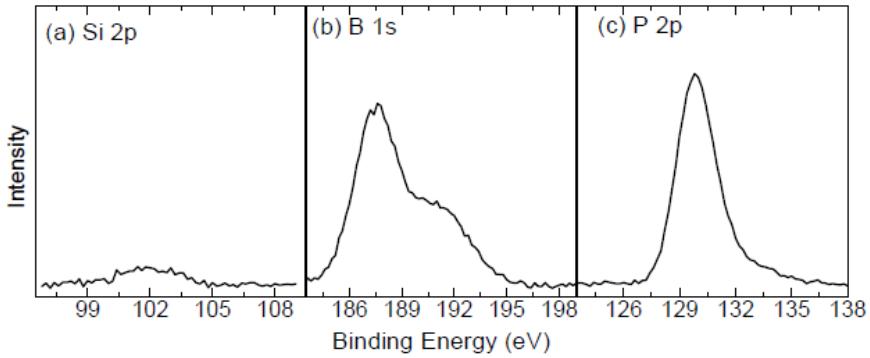

Figure S4. XPS spectra of BP8 after HF etching. (a) Si 2p (b) B 1s (c) P2p.

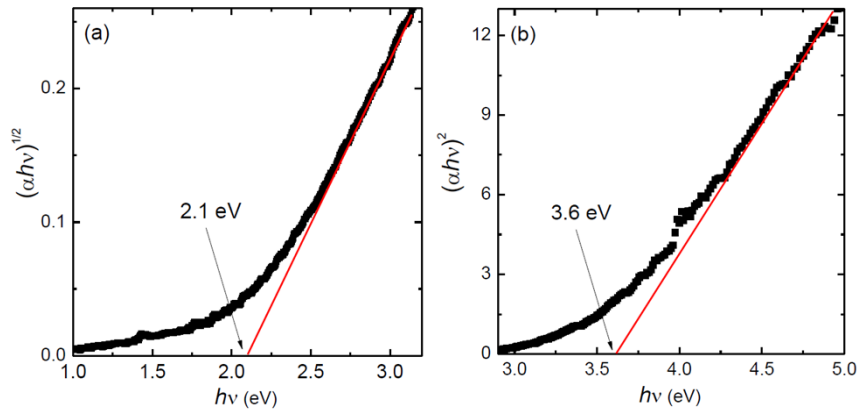

Figure S5. Tauc-plots of BP nanocrystals (BP8) for (a) indirect and (b) direct transitions