Supporting Information For

Mid-Wave Infrared Photoconductors Based on Black Phosphorous-Arsenic Alloys

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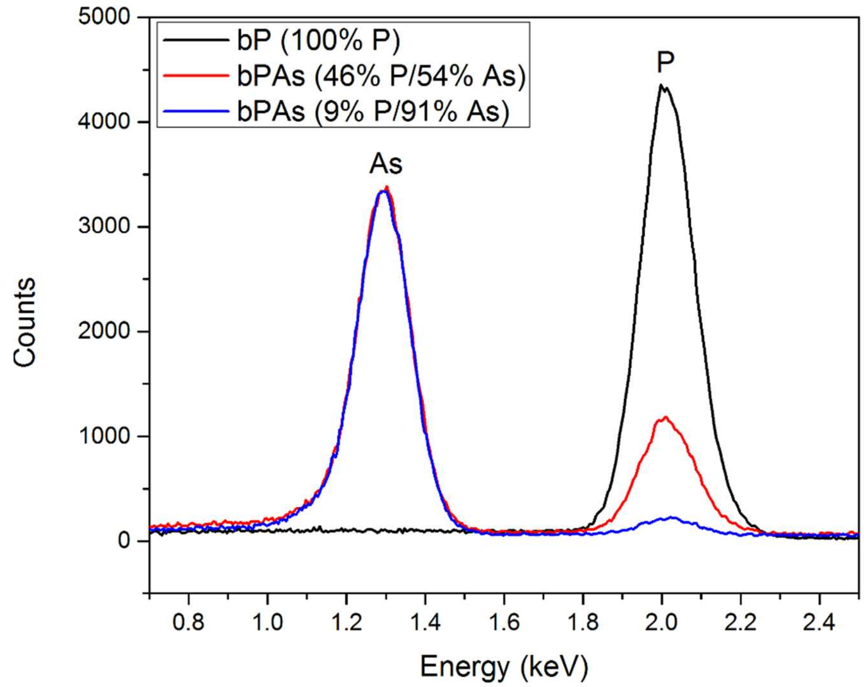

Figure S1. EDX Spectra, showing As Lα (1.282 keV) and P Kα (2.013 keV) peaks, measured for the various compositions of b-P and b-PAs studied here.

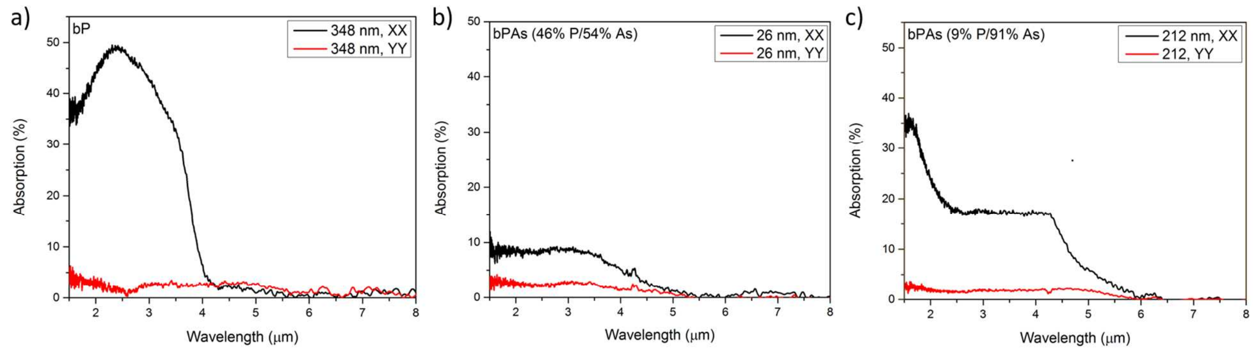

Figure S2. (a) Absorption spectra, calculated from 100-T-R in the X and Y directions measured on 348 nm thick b-P. (b) Absorption spectra, calculated from 100-T-R in the X and Y directions measured on 26 nm thick b-PAs (83% As). (c) Absorption spectra, calculated from 100-T-R in the X and Y directions measured on 212 nm thick b-PAs (91% As). Note that the total absorption is a strong function b-P/b-PAs thickness and refractive index.

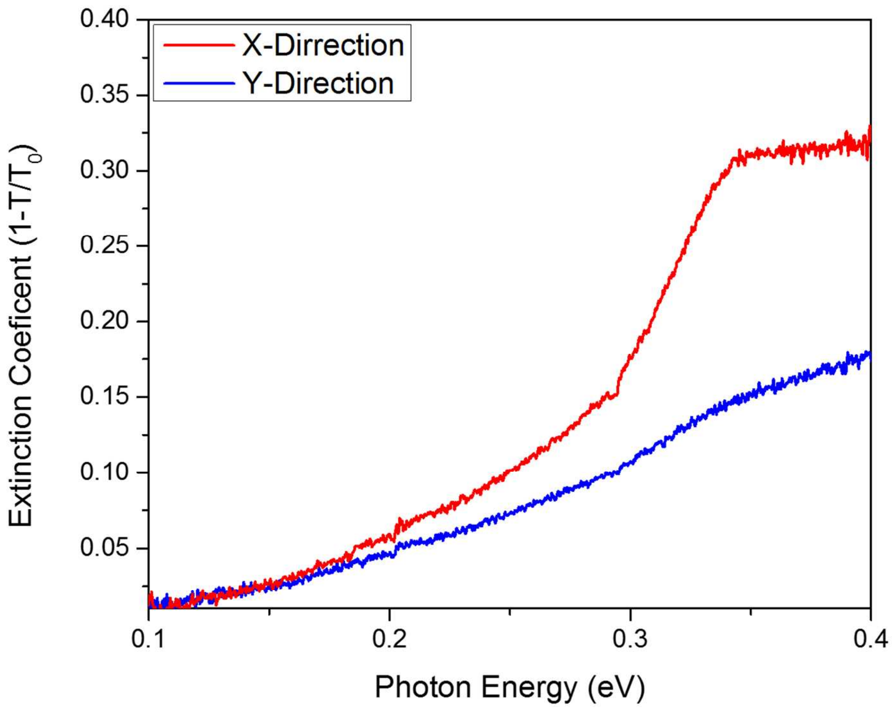

Figure S3. Extinction coefficient measured for a b-P crystal on a KBr substrate from transmission.

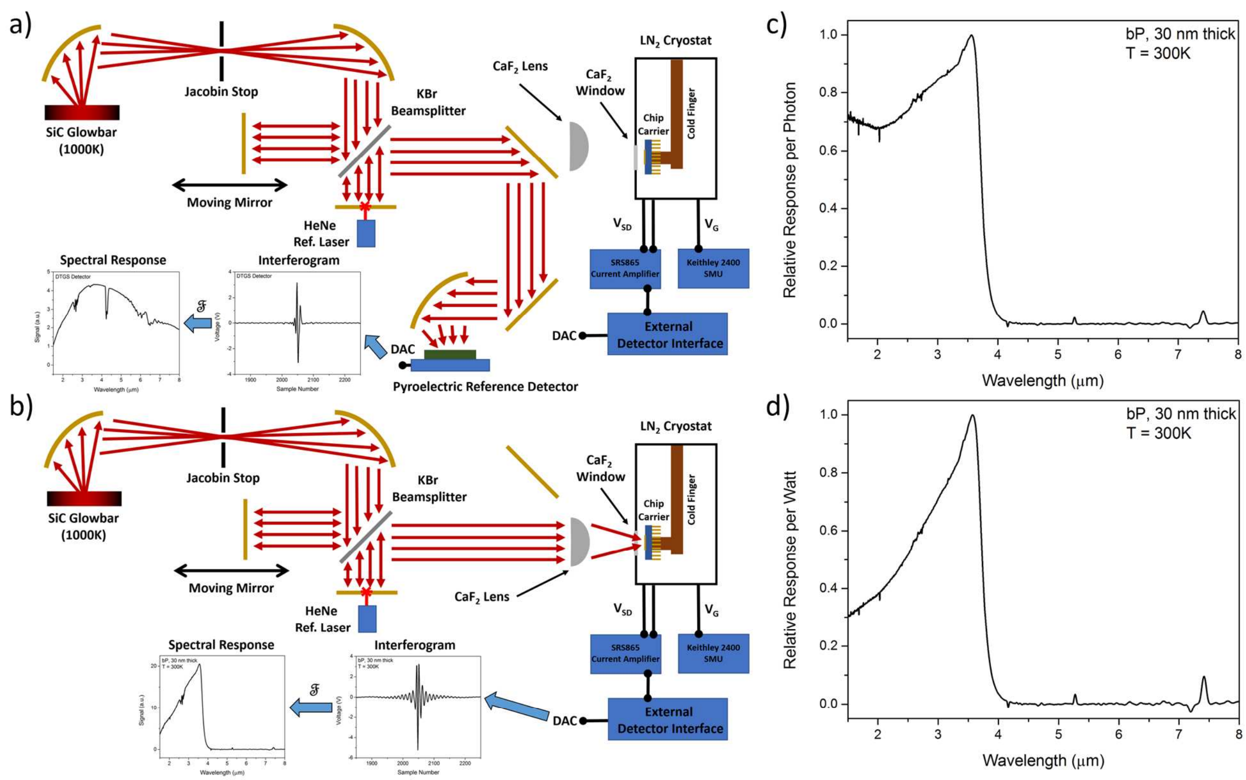

Figure S4. (a) Schematic of measurement setup used to measure the spectral content of the incident light on the b-P detector, measurements taken using the internal pyroelectric detector of the FTIR were performed at an optical velocity of 0.15 cm/s. (b) Schematic of measurement setup used to measure the spectral response of the b-P and b-PAs gated photoconductors. Light from the FTIR Glowbar was focused on the device using either a CaF2 lens or a Schwarzschild objective. During measurements, the gate voltage was modulated from V_g during the interferometer scan to -V_g during the wait period, in order to minimize hysterics effects (timing shown in Fig. S3). (c) Relative response per photon of a b-P gated photoconductor, calculated using the ratio of response from the b-P detector to the pyroelectric reference detector. (d) Relative response per photon of a b-P gated photoconductor, calculated using the ratio of response from the b-P detector to the pyroelectric reference detector and photon energy.

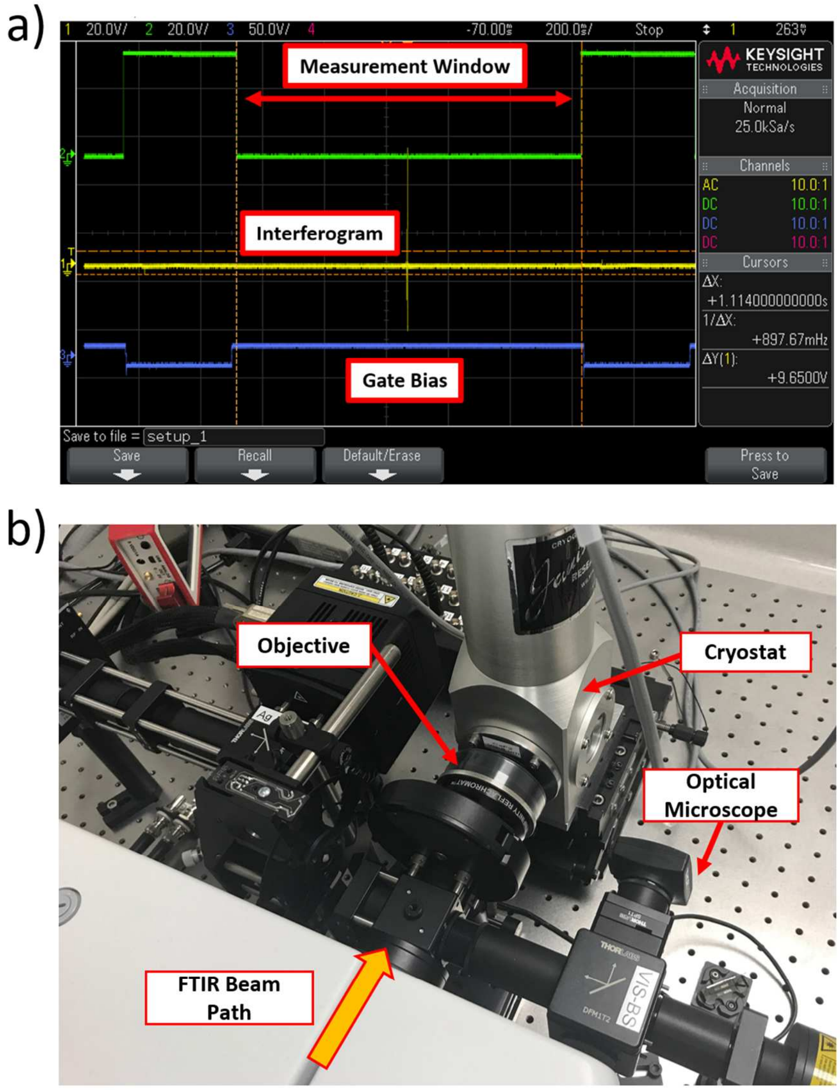

Figure S5. (a) Timing of gate biasing during FTIR measurements. During the measurement window, which is identified by an external trigger from the FTIR, the gate is held at the desired bias potential, V_g. During the rest period, the gate bias is held at $-V_g$, in order to minimize hysteresis effects. (b) Photograph of the optical setup used to measure the spectral and frequency response of the b-P and b-PAs gated photoconductors. Sample is placed in a 24-pin chip carrier in the cryostat. An external microscope is setup to locate and focus light on the sample with a reflective objective or CaF_2 lens.

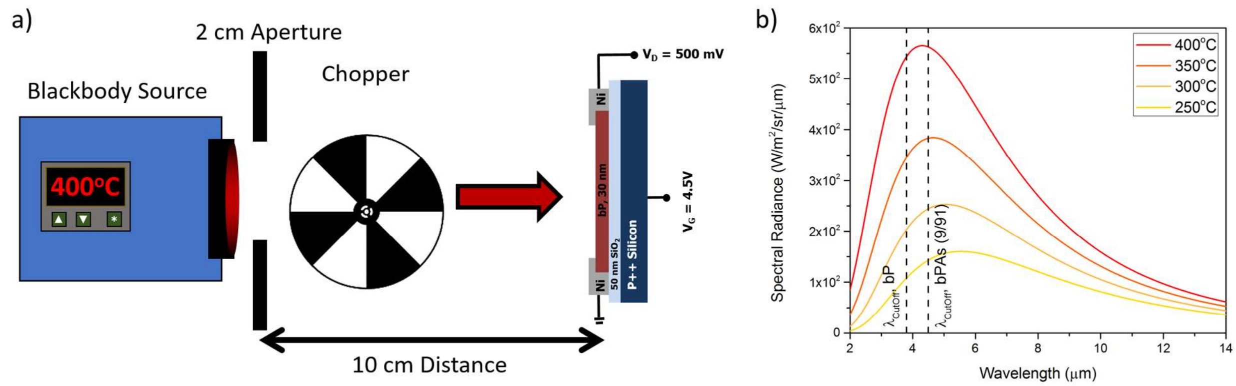

Figure S6. (a) Schematic of the setup used to measure the absolute responsivity and detectivity of the b-P detector. The sample was illuminated by a blackbody source held at 400°C-250°C (673 K-523 K). The beam was modulated using a chopper and the response of the gated photoconductor was measured using a lock-in amplifier. (b) Spectrum of the illumination on the sample at various blackbody temperatures calculated using Plank's law. The cut-off wavelengths for b-P and b-PAs (91% As) are indicated by dashed lines.