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# Supporting Information: Broadband Paper-Photodetectors for Visible & UV Light Detection

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## Verification of Employed Commercial Paper Sheets:

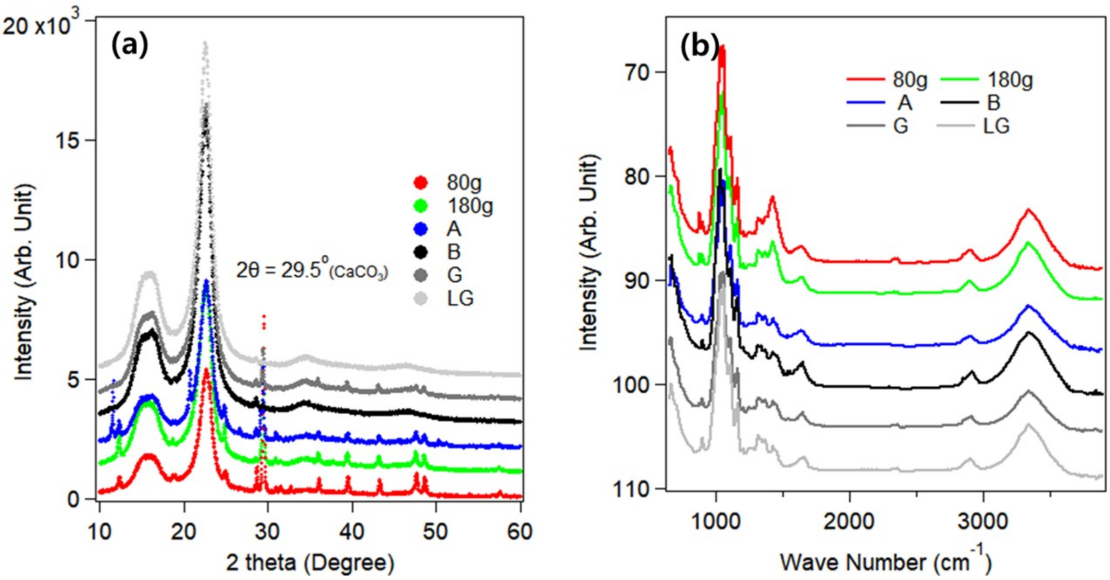


**Fig. S1. Verification of employed commercial paper sheets:** (a) X-ray diffraction spectra and (b) Fourier Transformation Infrared (FTIR) spectra of the employed commercial sheet papers, 80g (red dot or line), 180g (green), A (blue), B (black), G (gray), and LG (light gray).

X-ray diffraction (XRD) spectra (**Fig. S1a**) and Fourier Transform Infrared (FTIR) spectra (**Fig. S1b**) are obtained from the commercially available sheet papers used in this study, including 80g (red dot or line), 180g (green), A (blue), B (black), G (gray), and LG (light gray) as shown in Fig. S1. The XRD and FTIR spectra exhibit characteristic patterns and peaks associated with cellulose papers. [S1-S3] This confirms that the employed sheet papers are predominantly composed of cellulose.

Furthermore, SEM images of cellulose fiber bundles are presented in Fig. 1f, providing visual evidence of the cellulose-based nature of the sheet papers. This corroborates the conclusion that the employed papers are primarily cellulose-based materials. In addition to the features originating from cellulose papers, there are additional peaks observed in the XRD spectra of Fig. S1, which correspond to the presence of pigments such as $CaCO_3$. [S3]

**Simultaneous Measurement of Current Response and Voltage Response: Fig.S2** shows the voltage response and current response, which were measured simultaneously from the sealed-PPD, which was made of a 180g cellulose sheet paper. For the simultaneous measurements, the specifically connected DMM for voltage measurement (refer to Fig. 2) is serially connected to the ammeter (Keithley 6430 source meter) for current measurement. **Fig. S2a** displays the voltage response ($V_M$) measured using the DMMs connected in series. **Fig. S2b** shows the photocurrent ($I_P$) measured using the serially connected source meter. They are equivalent to each other. $V_M$ is proportional to $I_P$ as expected. The proportional constant is the internal impedance ($R_M$) of the DMM.

We observed a spike in the voltage response at approximately 1.1 V, which can be attributed to the internal impedance switch of the DMM, transitioning from 11 MΩ to 10 MΩ, as depicted in **Fig. S2b**. As mentioned in the main body of the manuscript, when the $V_M$ is less than 1 V, the internal impedance is 11 MΩ, whereas when the $V_M$ exceeds 1 V, the internal impedance switches to 10 MΩ. One can find that there is a notable switching of the internal impedance around at 1 V of $V_M$, as shown in Fig. S2a.

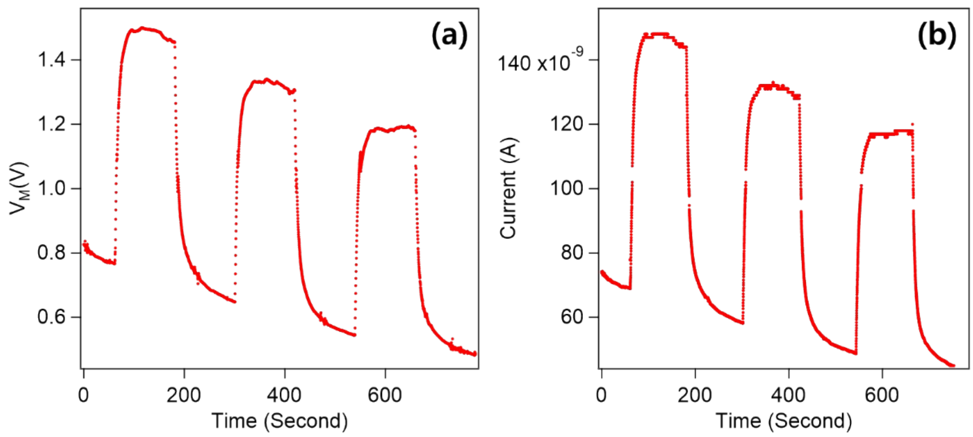


**Fig. S2.** The current and voltage were measured simultaneously from the sealed-PPD, which was made of a 180g cellulose sheet paper. The measurements were conducted using the specifically connected DMM for voltage measurement (refer to Fig. 2) with a serially connected ammeter (Keithley 6430 source meter) for current measurement. (a) The voltage ($V_M$) measured by the DMM. (b) The current measured by the ammeter.

## References


S1. U.P. Agarwal, S.A. Ralph, C. Baez, *et al. Cellulose,* 2017, **24,** 1971-1984.

S2. I. Hafez, E. Amini, & M. Tajvidi, *Cellulose,* 2020, **27,** 3773-3787.

S3. N.N. Brandt, A.Y. Chikishev, K. Itoh, *et al.*, *Laser Phys.,* 2009, **19,** 483-492