Supporting Information

Atmospheric Pressure Spatial Atomic Layer Deposition of p-type CuO thin films from copper (II) acetylacetonate and ozone for UV detection

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Figure S1 illustrates the XRD diffractogram of CuO sample prepared with 4000 ALD cycles at 275 °C. The results should a tenorite CuO phase with unobservable Cu_2O contribution.

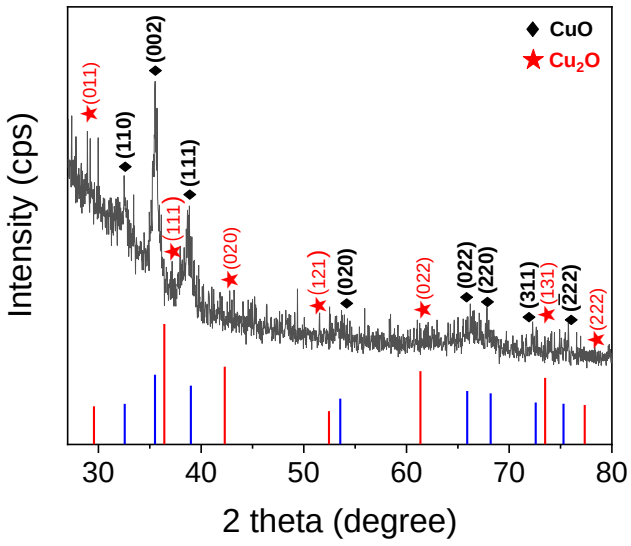

Figure S1: XRD pattern of CuO thin film fabricated with 4000 ALD cycles at 275 °C.

To illustrate the critical role of p-type CuO in the photodiode, we have performed the measurement of photocurrent in the two conditions: forward bias (1 V) and reverse bias (-1 V). With solely the photoactivity of ZnO, the photocurrent cannot significantly enhance (Fig

S2a), while with the built-in electric field created from p-CuO/n-ZnO heterojunction, we can observed the higher performance.

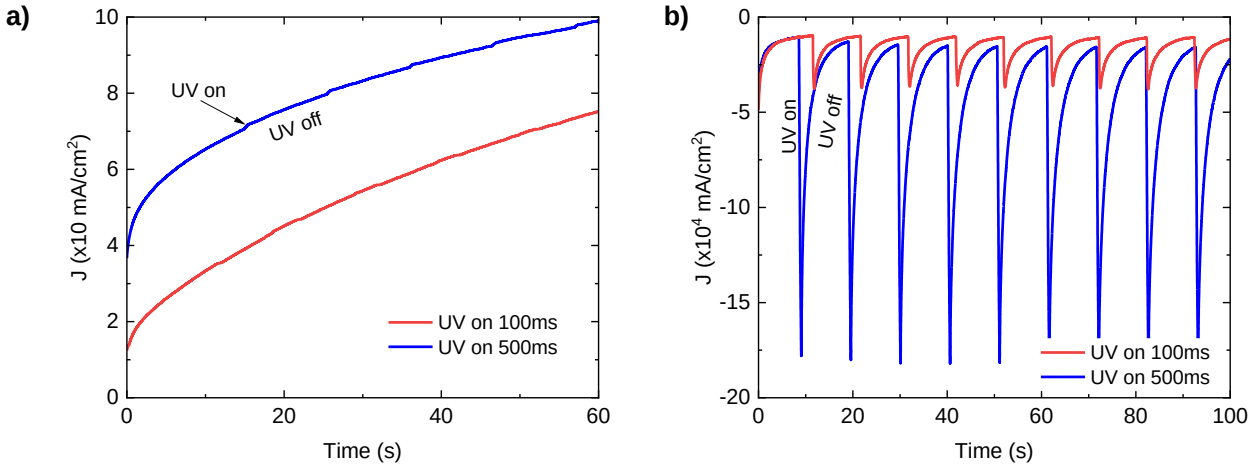

Figure S2: Photo-response versus time of p-CuO/n-ZnO photodiode under 365nm light illumination at a) forward bias 1 V and b) reverse bias -1 V, at room temperature conditions.

We conducted additional photocurrent measurements using 395 nm light, which lies beyond the primary absorption range of ZnO. As shown in Figure S3, the device demonstrates a weak but observable photo-response at 395 nm, while the performance at 365 nm can be clearly seen. This results indicate that the main role of p-type CuO in this UV diode is not the absorber but indeed to create an efficient junction with n-type ZnO to enhance the photocurrent in such a UV detector.

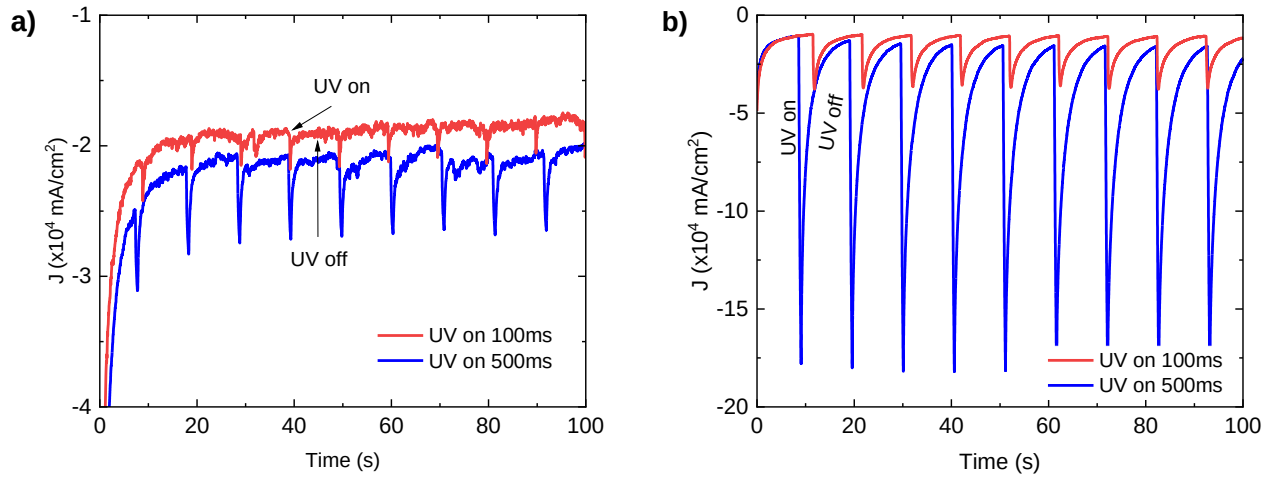

Figure S3: Photo-response versus time of p-CuO/n-ZnO photodiode under a) 395 nm and b) 365nm light illumination at -1 V reverse bias voltage, and at room temperature conditions.