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Boosted Photocurrent in Ferroelectric BaTiO₃ Materials via Two Dimensional Planar-Structured Contact Configurations

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ABSTRACT: Photocurrent can be generated in ferroelectric devices with vertical-structured sandwich configurations due to photovoltaic effect, which has potential applications in electronic devices such as photodetectors owing to no use of any external power source. However, how to effectively enhance the photocurrent in ferroelectric materials still remains one of the key challenges for these applications. We report a dramatic increase of photocurrent in a ferroelectric BaTiO₃-based self-powered photodetector by utilizing two dimensional planar-structured contact electrode configurations. As compared with that of conventional vertical-structured device, the fabricated planar-structured device exhibits over 900-fold enhancement of stable photocurrent under 365 nm UV light illumination. A physical model based on band energy theory has been utilized to explain the origin of the observed phenomenon. The remarkable enhancement of photocurrent in ferroelectric materials by using this route will open a new area of two dimensional planar-structured ferroelectric photodetectors.

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