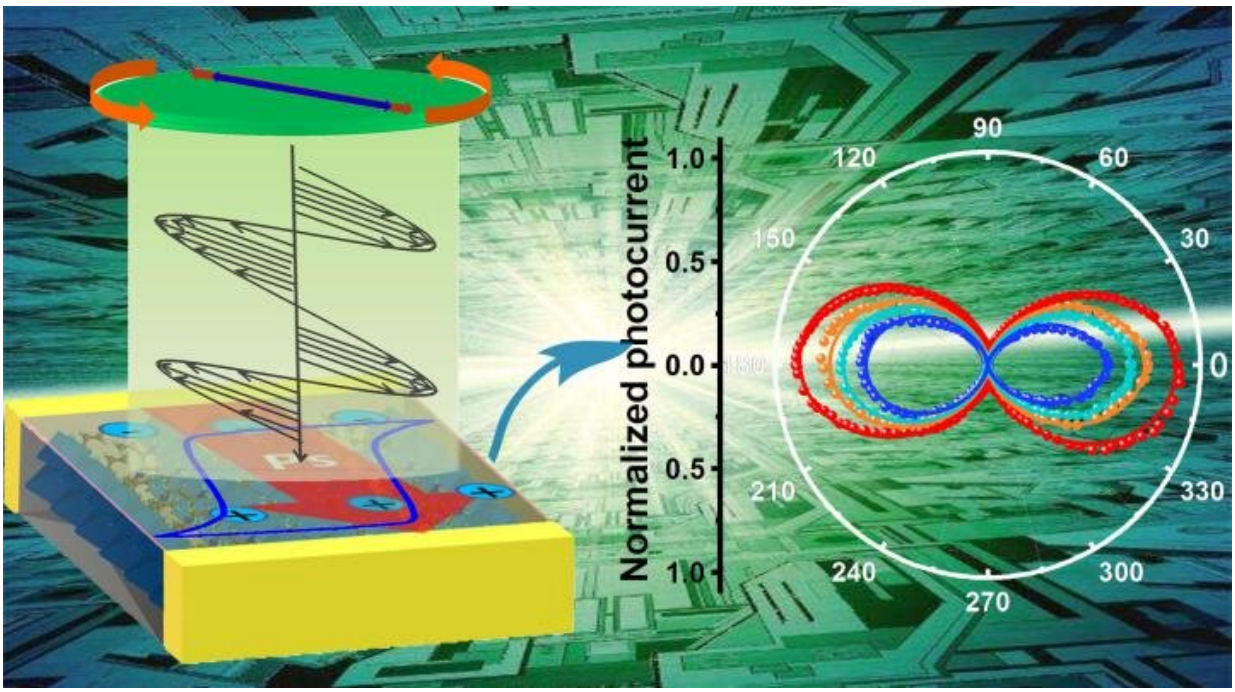
Remote sensing: Bulk photovoltaic effect exploited in 2-D trilayered hybrid ferroelectric

March 5 2020, by Liu Jia



Schematic illustration of the strategy. Credit: Prof. LUO's group

Polarized light detection plays an important role in remote sensing, near-field imaging, communication, and high resolution detectors. However, it remains a great challenge to achieve highly polarization-sensitive photodetection with large polarization ratio base on traditional

semiconducting materials due to the limitation of material/device structural anisotropy.

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In a study published in *Angewandte Chemie International Edition*, a research group led by Prof. LUO Junhua from Fujian Institute of Research on the Structure of Matter (FJIRSM) of the Chinese Academy of Sciences demonstrated a BPVE-driven highly efficient polarized light detection based on a two-dimensional (2-D) trilayered hybrid perovskite ferroelectric.

The researchers found that a polar 2-D trilayered perovskite architecture was adopted with a distinct spontaneous polarization of ~2.8 $\mu C/cm^2$ and a suitable optical bandgap of ~2.71 eV. Superior BPVE was shown with a near-bandgap photovoltage of ~ 2.5 V and a high on/off switching ratio of current (~ 104).

This angle-dependent photoresponse is ascribed to the inherent light-polarization dependence of superior BPVE, which arises from the optical rectification effect of ferroelectrics upon light irradiation, distinguishing from that of all the known polarized light detectors.

Besides, a polarization ratio was exhibited as high as ~15, which is far more beyond than those of reported devices based on nanowires and anisotropic 2-D materials.

This BPVE-driven polarized light detection is unprecedented, which opens up a new way towards highly efficient polarized light detection by leveraging the light-polarization dependence of the BPVE in 2-D multilayered hybrid perovskites., a research group led by Prof. Luo Junhua from Fujian Institute of Research on the Structure of Matter (FJIRSM) of the Chinese Academy of Sciences demonstrated a BPVE-driven highly efficient polarized light detection based on a two-dimensional (2-D) trilayered hybrid perovskite ferroelectric.

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More information: Yu Peng et al. Exploiting the Bulk Photovoltaic Effect in a 2D Trilayered Hybrid Ferroelectric for Highly Sensitive Polarized Light Detection, *Angewandte Chemie International Edition* (2019). DOI: 10.1002/anie.201915094

Provided by Chinese Academy of Sciences