ARTICLES

Journal of Semiconductors
(2021) 42, 052301
doi: 10.1088/1674-4926/42/5/052301

Facile fabrication of heterostructure with p-BiOCl nanoflakes and n-ZnO thin film for UV photodetectors

Longxing Su[1, 2], Weixin Ouyang[1], and Xiaosheng Fang[1, †]

[1]Department of Materials Science, Fudan University, Shanghai 200433, China

[2]Department of Physical Science and Technology, ShanghaiTech University, Shanghai 200433, China

Abstract: Herein, high-quality n-ZnO film layer on *c*-sapphire and well-crystallized tetragonal p-BiOCl nanoflakes on Cu foil are prepared, respectively. According to the absorption spectra, the bandgaps of n-ZnO and p-BiOCl are confirmed as ~3.3 and ~3.5 eV, respectively. Subsequently, a p-BiOCl/n-ZnO heterostructural photodetector is constructed after a facile mechanical bonding and post annealing process. At –5 V bias, the photocurrent of the device under 350 nm irradiation is ~800 times higher than that in dark, which indicates its strong UV light response characteristic. However, the on/off ratio of In–ZnO–In photodetector is ~20 and the Cu–BiOCl–Cu photodetector depicts very weak UV light response. The heterostructure device also shows a short decay time of 0.95 s, which is much shorter than those of the devices fabricated from pure ZnO thin film and BiOCl nanoflakes. The p-BiOCl/n-ZnO heterojunction photodetector provides a promising pathway to multifunctional UV photodetectors with fast response, high signal-to-noise ratio, and high selectivity.

Key words: ZnO thin film; BiOCl nanoflakes; heterostucture; UV photodetector

Citation: L X Su, W X O yang, and X S Fang, Facile fabrication of heterostructure with p-BiOCl nanoflakes and n-ZnO thin film for UV photodetectors[J]. *J. Semicond.*, 2021, 42(5), 052301. http://doi.org/10.1088/1674-4926/42/5/052301

Supporting Information

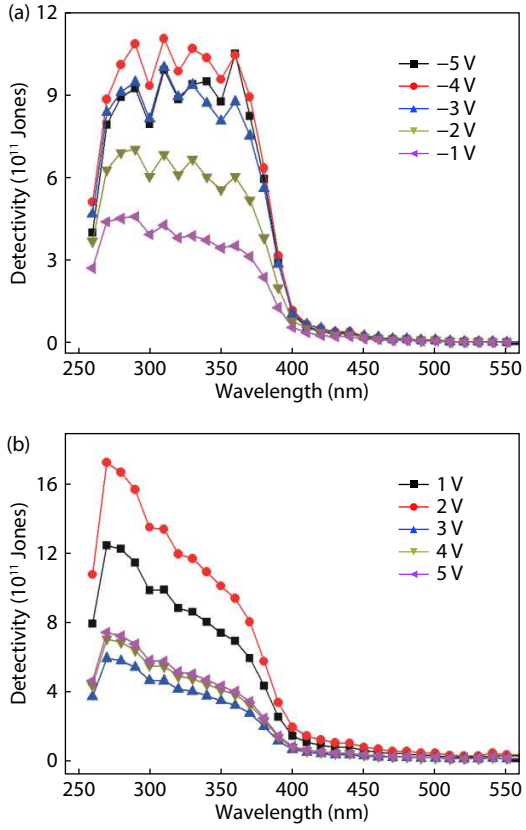

Fig. S1. (Color online) The detectivities of the p-BiOCl/n-ZnO photodetector at different negative biases (a) and positive biases (b).

Correspondence to: X S Fang, Xiaosheng Fang, Email: xshfang@fudan.edu.cn

Received 21 SEPTEMBER 2020; Revised 19 OCTOBER 2020.

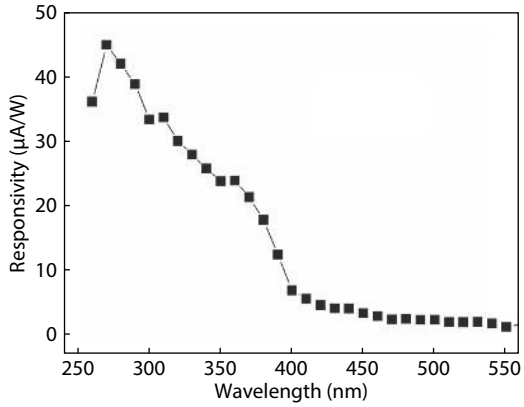

Fig. S2. The spectral responsivities of the p-BiOCl/n-ZnO photodetector under 0 V bias.

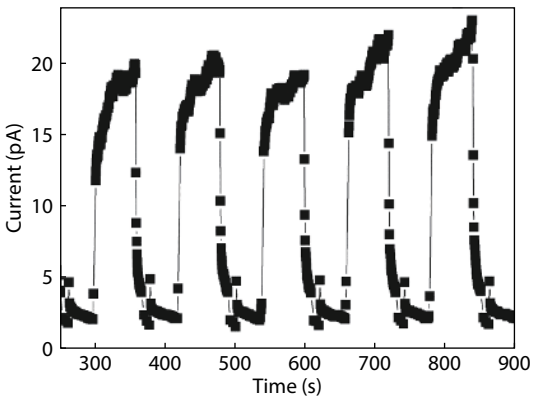

Fig. S3. The *I*–*T* curve of the p-BiOCl/n-ZnO photodetector under 350 nm (0.304 mW/cm^2) illumination at 0 V bias.