Solar blind avalanche photodetector based on the cation exchange growth of beta-Ga2O3/SnO2 bilayer heterostructure thin film

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Abstract

Solar blind photodetectors have shown a paramount encouragement owing to their promising applications in the fields of ultraviolet (UV) astronomy, fire alarms, missile warning, environmental studies, biological/chemical analysis and short range communication security. Due to the weak solar blind signal, there is a real need to develop solar blind avalanche photodiode (APD) with high internal avalanche gain to compete with the commercial Si APDs and photomultiplier tubes. Herein, we report the development of APD based on the growth of two wide band gap metal oxides operating within the solar blind region of the UV-spectrum (200-280 nm). It was found that the growth of beta-Ga2O3 on SnO2 thin film via cation exchange mechanism results in the development of a solar blind photodetector with ultrahigh sensitivity, high spectral selectivity, very fast response, high stability and high signal to noise ratio. The high external quantum efficiency of the APD developed was assigned to the avalanche multiplication effect. (C) 2016 Elsevier B.V. All rights reserved.

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