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High quality β-Ga_2O_3 film grown with N_2O for high sensitivity solar-blind-ultraviolet photodetector with fast response speed

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High quality β-Ga_2O_3 film is grown by using N_2O as reaction gas for the fabrication of high performance solar-blind-ultraviolet photodetector. Compared with traditional solar-blind-ultraviolet photodetector based on β-Ga_2O_3 film grown with O_2, the reported solar-blind-ultraviolet photodetector exhibits higher photoresponsivity of 26.1 A/W, larger on/off ratio ($I_{255\ nm\ light}/I_{dark}$) of 10^4, and faster response speed (a rise time of 0.48 s and a decay time of 0.18 s at 10 V. The high photoresponsivity and fast response speed of the reported β-Ga_2O_3 solar-blind-ultraviolet photodetector can be attributed to the reduction of scattering or / and trapped centre of photo-generated carriers formed in the film grown with N_2O.

Keywords: solar-blind-ultraviolet photodetector; high photoresponsivity; fast response speed; β-Ga_2O_3; N_2O; MOCVD

1. Introduction

Solar-blind-ultraviolet (SBUV) photodetector (PD), owing to its strong anti-interference property, has important applications in the fields of near-earth-, air-, marine-, secure-communications, and etc [1-3]. As is well known, SBUV signal will be strongly attenuated during its propagation process due to its strong scattering ability, as a result, the SBUV signal is too weak to be detected [4]. Thus, high sensitivity for SBUV PD is particularly important.

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