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High quality β -Ga₂O₃ film grown with N₂O for high sensitivity solar-blind-ultraviolet photodetector with fast response speed

D. Zhang^a, W. Zheng^b, R.C. Lin^b, T.T. Li^a, Z.J. Zhang^a, F.Huang^{b,*}

^aState key Laboratory of Optoelectronic Materials and Technologies, School of Physics, Sun Yat-sen University, Guangzhou, Guangdong, 510275, China

^bState key Laboratory of Optoelectronic Materials and Technologies, School of Materials, Sun Yat-sen University, Guangzhou, Guangdong, 510275, China

High quality β -Ga₂O₃ film is grown by using N₂O as reaction gas for the fabrication of high performance solar-blind-ultraviolet photodetector. Compared with traditional solar-blind-ultraviolet photodetector based on β -Ga₂O₃ film grown with O₂, the reported solar-blind-ultraviolet photodetector exhibits higher photoresponsivity of 26.1 A/W, larger on/off ratio ($I_{255\text{ nm light}}/I_{\text{dark}}$) of 10⁴, 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 -Ga₂O₃ 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 N₂O.

Keywords: solar-blind-ultraviolet photodetector; high photoresponsivity; fast response speed; β -Ga₂O₃; N₂O; 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.

* Corresponding author. State key Laboratory of Optoelectronic Materials and Technologies, School of Materials, Sun Yat-sen University, Guangzhou, Guangdong, 510275, China

E-mail addresses: huangfeng@mail.sysu.edu.cn

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