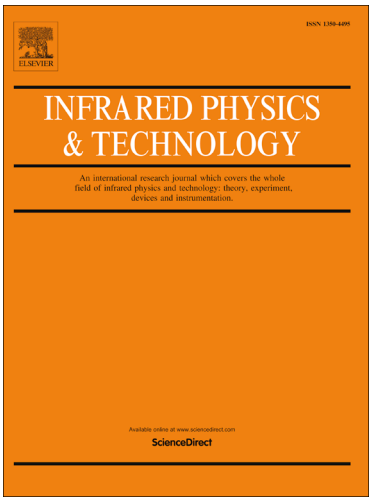

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Optical properties of beryllium-doped GaSb epilayers grown on GaAs substrate

Zhuo Deng, [1] Baile Chen, [1*] Xiren Chen, [2] Jun Shao, [2*] Qian Gong, [1, 3] Huiyun Liu, [4] and Jiang Wu [4*]

[1]*School of Information Science and Technology, ShanghaiTech University, Shanghai, China*
[2]*National Lab for Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai, China*
[3]*State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai, China*
[4]*Department of Electronic and Electrical Engineering, University College London, London WC1E 7JE, United Kingdom*

Abstract

In this work, the effects of p-type beryllium (Be) doping on the optical properties of GaSb epilayers grown on GaAs substrate by Molecular Beam Epitaxy (MBE) have been studied. Temperature- and excitation power-dependent photoluminescence (PL) measurements were performed on both nominally undoped and intentionally Be-doped GaSb layers. Clear PL emissions are observable even at the temperature of 270 K from both layers, indicating the high material quality. In the Be-doped GaSb layer, the transition energies of main PL features exhibit red-shift up to ~7 meV, and the peak widths characterized by Full-Width-at-Half-Maximum (FWHM) also decrease. In addition, analysis on the PL integrated intensity in the Be-doped sample reveals a gain of emission signal, as well as a larger carrier thermal activation energy. These distinctive PL behaviors identified in the Be-doped GaSb layer suggest that the residual compressive strain is effectively relaxed in the epilayer, due possibly to the reduction of dislocation density in the GaSb layer with the intentional incorporation of Be dopants. Our results confirm the role of Be as a promising dopant in the improvement of crystalline quality in GaSb, which is a crucial factor for growth and fabrication of high quality strain-free GaSb-based devices on foreign substrates.

Keywords: Gallium Antimonite, Beryllium doping, photoluminescence, threading dislocation, strain

[*] Electronic mail: chenbl@shanghaitech.edu.cn, jshao@mail.sitp.ac.cn, jiang.wu@ucl.ac.uk