REDUCED STRESS OF GAN FILM ON SAPPHIRE USING AUTOMATIC FABRICATION OF TRENCH STRUCTURES

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ABSTRACT: Because of the different thermal expansion coefficients in these two materials, serious curvature and residual stress are existed during the growth of an epi-GaN layer on Sapphire. By using theoretical calculation and a simulation model analysis using the finite element method to describe the realistic shape of wafer curvature on epi-GaN wafers, we examine the influence which different thickness and thermal expansion coefficients in the top epi-GaN layer have on wafer curvature released. In addition a new automatic process to reduce wafer curvature and to relax residual stress is proposed. With an additional laser treatment on a sample surface after the growth of the top epi-GaN layer on a Sapphire substrate has taken place, the wafer curvature can be reduced from the original 45 μm to 37 μm in 2 inch wafer with an optimized surface structure design.

Keywords: Automation, Stress, GaN, Curvature, Laser, Surface Structure.

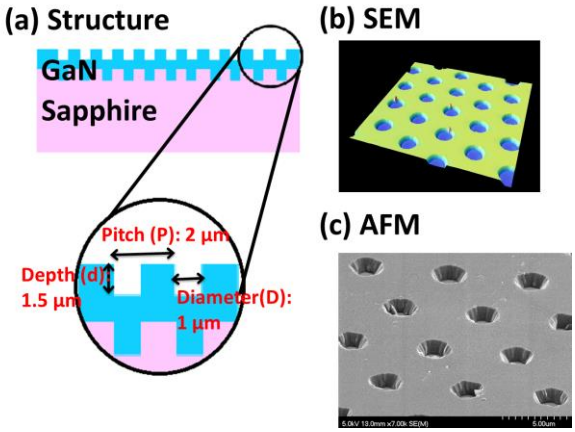

Fig.1 Schematic structure, Pattern Sapphire Process (PSP) LEDs structure.

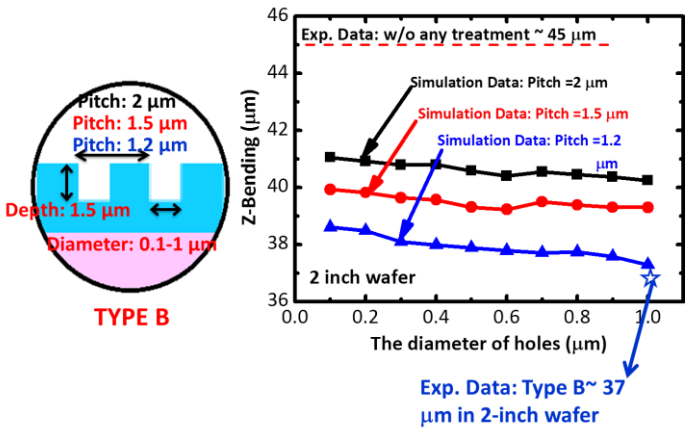

Fig.2 Simulated wafer curvature results**.**

Ref. M. H. Liao, C. H. Chen, L. C. Chang, and C. Yang, "A novel stress design for the type-II hetero-junction solar cell with superior performance," Journal of Applied Physics, Vol. 111, 063109, Mar. 2012.