Improvement of Kink Characteristics of 850nm AlGaAs/GaAs Implant VCSEL Utilizing Silicon Implantation Induced Disordering

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850 nm Vertical Surface Emitting Lasers (VCSEL) have been widely used as light sources for fiber optic data communication applications. Kink in current vs light output (L-I) has been always an issue in the gain-guided proton implanted VCSEL. In this paper, we demonstrate a nearly kink free operation of implant vertical-cavity surface-emitting laser (VCSEL). The structure of a n-type 35-period-Al0.15GaAs Al0.9Ga0.1As distributed Bragg reflectors (DBRs) and 1fclading layer with 3 AlGaAs/GaAs quantum wells were grown on an n-GaAs (100) substrate by metal organic chemical vapor deposition (MOCVD). Then 13x13 gm2 emitting aperture was defined using silicon implantation induced disordering. The whole structure was finished by subsequent MOCVD re-growth of p-type 22-period-Al0.15GaAs Al0.9Ga0.1As DBRs and cap layer. More than 90% series resistance of the VCSELs is within 35-40 Ohm indicating good re-growth interface. Nearly kink-free L- I curves with Ith 2-2.5 mA were observed in our VCSELs indicating the index-guiding effect. The index different between the emission and surrounding regions can be attribute to silicon implantation induced disordering. The slope efficiencies are between 0.35W/A to 0.45W/A. The threshold current change is less than 0.5mA and the slope efficiency change is less than 30% when the substrate temperature is raised from 25C to 90C. Finally we performed eye diagram measurement of our VCSELs on TO- 46 operating at 2.5Gb/s with 8mA bias and 9dB extinction ratio. The wide open eye pattern indicates good performance of our VCSEL which can be attributed to our kink-free L-I performance. All of these advantages-nearly kink free, temperature performance, high speed performance make the novel VCSEL promising in the opto-electronic and other commercial applications in the coming days.