Influence of the Microwave Power in an ECR-PECVD Reactor on Dielectric-cap Induced Blue-shift in 1.55 um Laser Structures - J. Wojcik, B. Robinson, D.A. Thompson, and P. Mascher (McMaster University)

Bandgap modification of 1.55 μm three-quantum-well laser structures was carried out using ECR-PECVD-grown SiO_2 dielectric capping and rapid thermal annealing. The SiO_2 caps had thicknesses of about 1000 Å and refractive indices of around 1.46. A study of the influence of the microwave power shows that increasing in the microwave power causes a small increase (about 20%) in the blue-shift while at the same time it decreases (by a factor of four) the photoluminescence (PL) yield from the sample.

The photoreflectance technique (PR) was used to detect the blue shift of the ground state and to identify the nature of the recombination channel in PL. The comparison of PL and PR results shows that, at room temperature, free-carrier recombination without any defect states takes place. This suggests that the silicon-oxide films change the quantum well profile, and do not generate any significant increase of the defect density in the active region of the laser structure even after microwave power processing. Thus, it is important to use low microwave power (450W – 500W) for quality and reproducibility.

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