

[IV-17]

Formation of a tensile-strained interfacial layer and the effect of growth interruption on the interfaces of InGaAs/InP superlattice grown by LP-MOCVD

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We have grown InGaAs/InP superlattice at 620°C by LP-MOCVD. For all samples cell pressure was 76 Torr and flow rate of the carrier gas was 12 slm. We obtained an average FWHM (full width half maximum) of 5.1meV from a 95Å InGaAs well. The peak position and the FWHM show 2meV and 0.7meV run-to-run reproducibility, respectively from PL (photoluminescence) measurement at 9K.

The formation of highly tensile-strained interfacial layer were observed during growth of InGaAs/InP superlattice without growth interruption at the interface between InGaAs and InP. And as shown in Fig.1, the interfacial layer were removed by inserting a growth interruption step after an InP growth. During this growth interruption time, we changed the supply of source gas. Hydrogen purge and PH₃ purge were tried. From this results, it is presumed that the tensile-strained layer is formed by source gas mixing during the gas exchange time between InGaAs and InP growth.

But as shown in Fig.2, growth interruption makes a tail in PL spectrum at a lower energy side when no PH₃ was supplied during the interruption time. This PL tail was so weak that the FWHM of the main peak did not change, but the intensity of the tail increases with the growth interruption time. These results indicate that this tail was caused by P desorption from the InP surface exposed to H₂ atmosphere. Some of P vacancies formed during growth interruption time can be trapped at the InGaAs-InP interfaces. The interdiffusion between As and P may be enhanced accordingly, and the effective well width increases.

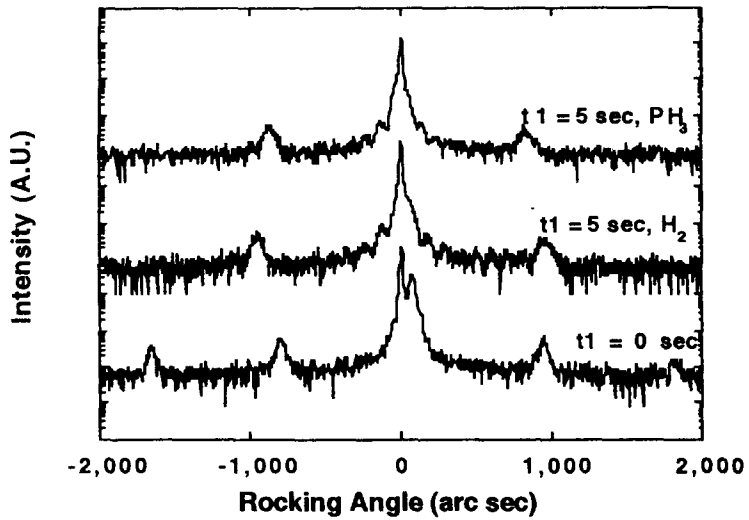


Fig.1 DCD rocking curves of InGaAs/InP superlattices grown at various t_1 interruption conditions. For all samples growth temperature was 620°C and other growth interruption steps were maintained constantly.

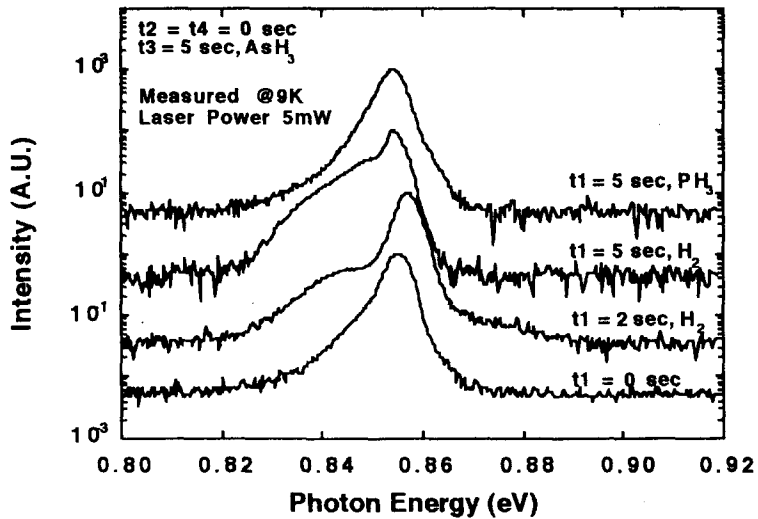


Fig.2 PL spectra obtained from InGaAs/InP superlattices grown at various t_1 interruption time conditions. For all samples, growth temperature was 620°C and the other growth interruption steps were maintained constantly.