Evidence of Gain in Cleaved Facet II-VI Quantum Well Structures through Photoluminescence Spectroscopy

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Measurement of gain in light-emitting quantum wells using etched facet semiconductors is time-consuming and may damage the quantum well material. Photoluminescence measurements of cleaved facet samples can be fast and reliably correlate with the optical gain produced by the quantum well structure while preserving the integrity of the material. It has been shown that samples had an optical gain when their InP substrates were replaced with sapphire ones through the process of etching and transferring. However, this can be a very tedious process since there is a chance the sample can be damaged. Cleaved facets in semiconductor lasers are a preferred way of manufacturing due to the ease of fabrication. The goal of this project is to analyze surface emission of II-VI quantum well semiconductor structures using PL before and after cleaving a facet to observe if optical gain occurs. The combination of a quantum well structure and cleaving a facet will produce a semiconductor of great quality which will be seen in the spectra images as a line that has an increase in its slope. From analyzing samples it was found that the number of quantum wells didn't matter for showing evidence of optical gain, at room temperature a cleaved and strained material shows evidence of gain, probing different positions on a sample can cause a slight shift in the peak, and a cleaved and non-cleaved strained material at low temperatures show the onset of lasing.

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