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Structural Analysis of a GaAs/Al_xGa_{1-x}As Hot Electron Light Emitter Using Double Axis X-Ray Diffraction

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Abstract: We report on interference peaks in double axis x-ray rocking curves of tunable wavelength hot electron light emitters. The device is based on a p-GaAs and n-Ga_{1-x}Al_xAs heterojunction containing an inversion layer on the p- side, and GaAs quantum wells on the n- side of the junction, a construction known as HELLISH-2 (Hot Electron Light Emitting and Lasing in Semiconductor Heterostructure-Type 2). The interference has been shown to strongly depend on the periodicity of the device structure. Experimental curves are compared with simulated rocking curves. Some structural parameters, such as total epilayer thickness, composition ratio and quantum well width and barrier width were obtained. It has been shown that double axis x-ray diffraction is a very helpful for the device designer as well as the crystal grower.

Key Words: X-ray diffraction, structural analysis, semiconductor devices, hot electrons, LED

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