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| **Title:** | A Design Method for a QW VCSEL for operating at 980 nm using In0.2Ga0.8As/GaAs Materials and its Performance Analysis | | | |
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| **Published Journal Name:** | AIUB Journal of Science and Engineering (AJSE) | | | |
| **Type of Publication:** | Journal | | | |
| **Volume:** | 9 | | Issue | 1 |
| **Publisher:** | AIUB Office of Research and Publication | | | |
| **Publication Date:** | August 2010 | | | |
| **ISSN:** | | 1608-3679 (Print) | | |
| **DOI:** |  | | | |
| **URL:** | https://orp.aiub.edu/ajse-09-01 | | | |
| **Other Related Info.:** |  | | | |
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| **Abstract:** |  |
| In this paper, a method for designing a 980 nm In0.2Ga0.8As/GaAs quantum well (QW) VCSEL has been presented. Using this method the strain induced shift of In0.2Ga0.8As has been computed which has been used in the computation of energy gap for the above mentioned combination of materials in the active region. The material gain for this strained In0.2Ga0.8As/GaAs QW has been computed for analyzing the performance of the VCSEL. The material gain and transparency carrier density for GaAs and In0.2Ga0.8As materials are optimized with the aim of designing a 980 nm In0.2Ga0.8As/GaAs QW VCSEL. A higher material gain with lower transparency carrier density is chosen for designing a 980 nm VCSEL. For the designed VCSEL, appropriate threshold current and modal gain have been computed. Using theses values the plots of output power vs. time as well as modulation performance have been obtained. From the plots of bias voltage vs. injection current it is found that a small voltage of 1.8 volt is required to reach the threshold current of 1.5 mA at 250C. From the plot of output power vs. time at 300K a maximum optical output power of 5 mW is obtained at 7.4 mA (≈ 5Ith) injection current and the corresponding obtained modulation bandwidth is 16.5 GHz which indicates the superior performance of the designed VCSEL compared to the similar results of other research works. | |