# Investigation of optical properties of bismide quantum structures


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GaAsBi heterostructures are an attractive candidate to develop GaAs-based applications for near-infrared optoelectronics, such as lasers, photodetectors, solar cells, terahertz devices [1], etc. This is mainly due to the large band gap reduction possible with incorporation of small amounts of Bi, relatively temperature insensitive band gap and large spin–orbit splitting. However, the growth of GaAsBi quantum structures is a challenging task due to the larger size of bismuth atoms compared to arsenic and gallium atoms, low growth temperature, and stoichiometric As/Ga flux ratio. Therefore, this work extensively examines the impact of non-standard growth methodologies and quantum structure designs on optical properties. The influence of elevated temperature during the barrier growth, parabolic design of barriers and thermal annealing of GaAsBi quantum wells were investigated using temperature and excitation dependent photoluminescence technique (Fig. 1). It was demonstrated that optical properties of GaAsBi quantum structures are sensitive to the change of technological conditions and a thorough investigation of the relationships between technological parameters and optical properties is crucial for further optimization of bismide-based quantum structures.

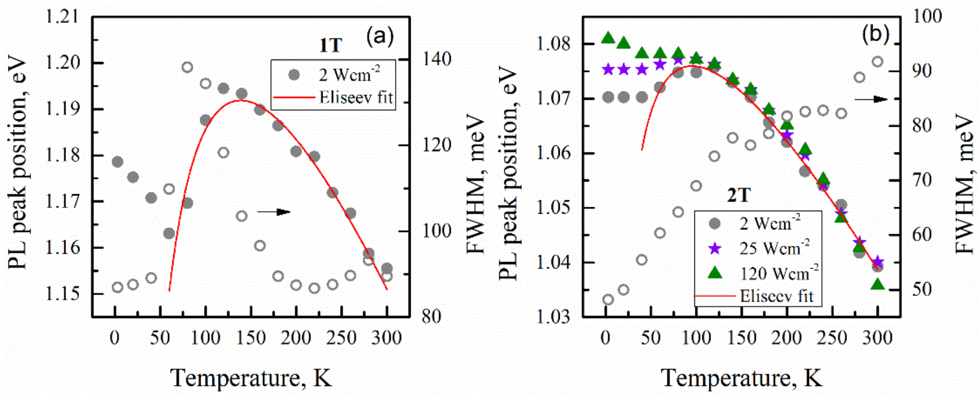


**Figure 1**: Temperature dependence of the spectral position and width of PL band of GaAsBi multiple quantum wells: (a) sample 1T was grown using one substrate temperature and (b) sample 2T was grown using two substrate temperatures.


[1] S. Wang, L. Pengfei, eds. Bismuth-Containing Alloys and Nanostructures (Springer, Singapore, 2019).