Optical properties of type II quantum wells based on GaSb and InAs emitting in a mid infrared range

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Mid-infrared semiconductor lasers are continuously increasing their application range during the last years including for instance gas sensing for detection and control of the presence or concentration of harmful gases like CO_2, SOx, NH_3, and many others. The benefits of optical detection methods have been limited mainly by the lack of suitable laser light sources, which have to provide the sensing wavelength in single mode and continuous wave (cw) operation in order to provide the required wavelength and its tunability. Hereby, we present fundamental optical and electronic properties of a type II quantum well system potentially able to cover spectrally the range of 2 to 8 μm, and beyond, and is possible to be integrated in a photonic sensor unit for gas detection.

There will be reviewed the optical properties of investigated type II "W-shaped" structures, deposited on two different substrates – InSb and InAs. It has been investigated structural parameters like as the band offsets importance, and its sensitivity to the layers composition, the active type II transition oscillator strength versus various structure parameters and external factors as temperature or electric field, and the predominating carrier loss mechanisms. For that a combination of several spectroscopic techniques have been used, both emission-like (photoluminescence) and absorption-like (modulated reflectivity spectroscopy) supported by the energy level calculations employing a multiband **kp** model. Eventually, the potential for further material optimization and prospects for the improved device performances will be given.

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References

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