Recent Progress in InAs-based Interband Cascade Lasers

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BIOGRAPHY

Rui Q. Yang: Dr. Yang received his Ph.D in physics in 1987. He is a professor at the University of Oklahoma (OU) with research activities ranging from condensed matter physics to semiconductor quantum devices such as mid-infrared lasers and detectors, and photovoltaic devices. Prior to joining OU 2007, he was a Principal Member of Engineering Staff and a Task Manager at the Jet Propulsion Laboratory (JPL), California Institute of Technology, Pasadena, California, where he led the development of interband cascade lasers for applications in Earth sciences and planetary explorations. He received the Edward Stone Award in 2007 from JPL for outstanding research publication and the successful accelerated infusion of cutting-edge interband cascade semiconductor laser technology into flight mission readiness. The lasers that he invented and developed with his colleagues at JPL have been selected for NASA flight mission to Mars. He has authored/co-authored more than 100 refereed journal articles and two book chapters with 4 patents.

TECHNICAL ABSTRACT

After about 16 years of exploration and development, interband cascade (IC) lasers [1] have now been proven to be capable of continuous wave (cw) operation at room temperature and above for a wide wavelength range of 2.9 to 5.7 µm in the mid-infrared spectral region [2-3]. In contrast to quantum cascade (QC) lasers based on intersubband transitions, IC lasers circumvent the fast phonon scattering issue by using the transition between conduction and valence bands for photon emission. As such, the threshold current density is significantly lowered with high voltage efficiency, resulting low power consumption. Here, we will present our recent progress in InAs-based IC lasers, which use plasmon cladding layer to replace superlattice cladding, resulting in improved thermal dissipation and extended lasing wavelengths of IC lasers [4-5].

REFERENCES


Keywords: mid-infrared lasers, III-V semiconductors, semiconductor quantum wells, semiconductor heterostructures