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InP-based antimony-free lasers and photodetectors in 2-3 μ m band

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In addition to antimony containing materials on GaSb substrate, the mature epitaxial growth and processing technology, as well as higher thermal conductivity, makes the antimony-free materials on InPa good candidate to cover 2-3 μ m wavelength range. For In_xGa_{1-x}As QW lasers the wavelength can be tailored to this range by increasing the indium content in the QWs, whereas significant strain is introduced and confinement become poor, so the structural design, control of epitaxial quality and suppression of dislocations become main concern. For PDs of longer wavelength, the indium content should also be increased, a quite large lattice mismatch need to be relaxed through suitable buffer. In this talk, our efforts on InP-based antimony-free QW lasers and In_xGa_{1-x}As PDs are reviewed. For lasers, novel triangular QW was used to increase the lasing wavelength while restricting the strain. Digital alloy technology was used to form triangular QW during the MBE growth. CW lasing from 2.0 to 2.4 μ m at room temperature has been achieved. To extend the emission wavelength longer, metamorphic scheme was employed on In_{0.8}Al_{0.2}As template to produce a virtual substrate with larger lattice constant than InP for InAs QWs. CW lasing wavelength up to 2.73 μ m have been demonstrated. The cutoff wavelengths of PDs have been shifted from 1.7 μ m up to 2.9 μ m. The PDs using InAlAs buffer and cap layers with wider bandgap were grown and demonstrated, and p-on-n ort n-on-p PD configuration was applied. The buffer schemes and growth conditions were optimized.

Biography

Zhang Yong-Gang received BS degree from Nanjing Institute of Posts and Telecommunications, China in 1982. He gained MS and PhD degrees from Shanghai Institute of Metallurgy (now named Shanghai Institute of Microsystem and Information Technology), Chinese Academy of Sciences in 1987 and 1996 respectively, and served here since 1987. His research interests include III-V semiconductor optoelectronic materials, devices and applications. He had been a full-Professor at the State Key Laboratory of Functional Materials for Informatics since 1996, and supervised 25 PhD and MSc students there.

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