NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
School of Electrical and Electronic Engineering

COEB PHOTONICS
COEB - Centre for OptoElectronics and Biophotonics

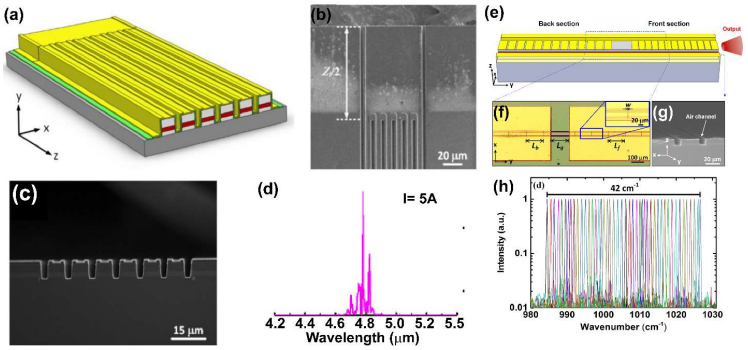
Mid-IR and Terahertz Science and Technologies

Research Interests

We are going to investigate the fundamental properties (optical and electrical) of semiconductor (quantum cascade lasers) and nanophotonic devices (such as graphene optoelectronic devices) in the infrared frequency regimes (including mid-IR (~3-30 μm) and terahertz (~60-300 μm)) to improve their performance. Exploration of their broad potential applications is also one of the key focuses.

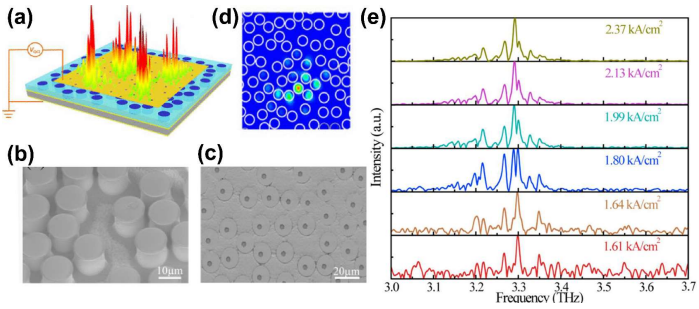
Quantum Cascade Lasers

High Power Mid-IR QCLs and Broadly Tunable Mid-IR QCLs



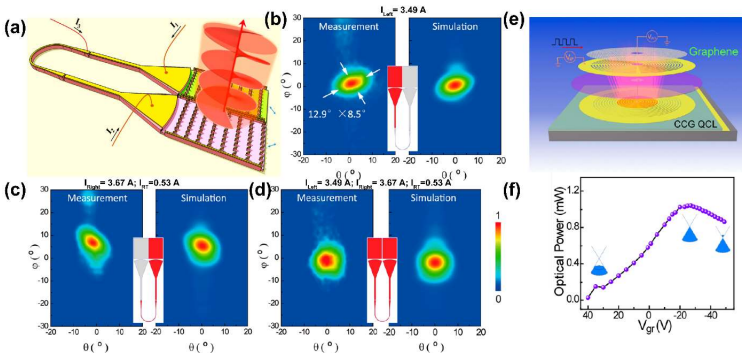
(a) 3D schematic of Talbot-cavity QCL.(b-c) SEM images of the Talbot cavity (b) and output facet of the QCL array (c). (d) laser spectrum of Talbot-cavity QCL. (e-g) 3D schematic diagram, optical microscopy and SEM of the slot-QCLs. (h) Tunable single-mode spectra of slot-QCLs.

Localized Multimode Random QCLs



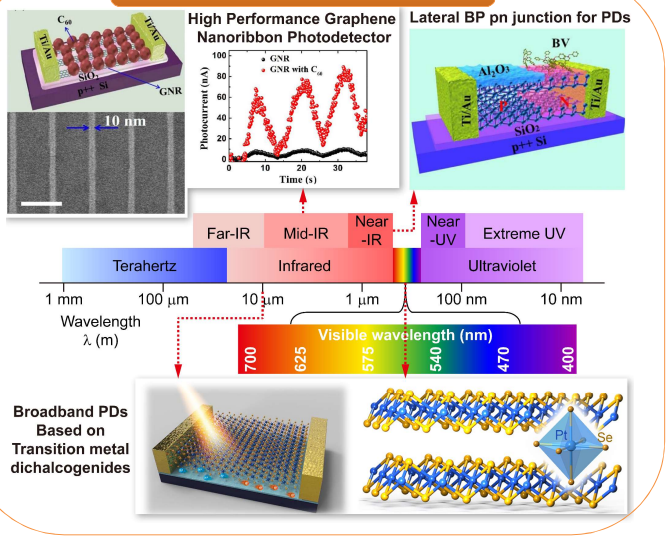
(a) 3D schematic diagram of a surface emitting random QCL. (b) SEM images of the quantum cascade pillars at an oblique and (c) the surface of the QCL device. (d) Typical localized mode. (e) Emission spectra of a random QCL at different pumping current densities.

Dynamically Tunable Polarization THz QCLs and Integrated THz Graphene Modulator



(a) Schematic drawing of two phase-locked THz QCLs with metasurfaces, which show tunable polarization of THz frequency radiation. (b-d) Measured and simulated far-field patterns of the device with different pumping conditions.(e) Schematic illustration of QCL integrated graphene modulator. (f) V_G dependence of the output power of the concentric-circular grating QCL with the graphene.

NanoPhotonics



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