Quantum dot micro-disk lasers directly grown on (001) Si emitting at 1.3um at room temperature

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Integrating high-performance III-V devices on the mature silicon platform has been a long pursuit over the past few decades. Although wafer bonding has been successfully demonstrated for integrating various III-V devices including lasers on Si, direct epitaxial growth is a desirable alternative. In collaboration with groups at Harvard and UCSB, we have recently demonstrated continuous-wave optically-pumped micro-disk lasers epitaxially grown on silicon with single mode lasing at communication wavelengths up to room temperature. Growth of the InAs quantum dots (QDs) gain medium was carried out by MBE on high crystalline quality GaAs-on-silicon templates prepared by MOCVD. Special defect filtering techniques have been employed to minimize the impact of the highly lattice-mismatched heteroepitaxial growth on (001) silicon substrates. Compared with quantum wells, the multi-stack InAs QDs are less sensitive to residual defects originated from the hetero-interfaces. Using QDs in a micro-disk resonant cavity with minimized non-radiative surface recombination leads to low-threshold lasing in the MDs a few microns in diameter.

Bio:
Professor Kei May Lau is Fang Professor of Engineering at the Hong Kong University of Science and Technology (HKUST). She received the B.S. and M.S. degrees in physics from the University of Minnesota, Minneapolis, and the Ph.D. degree in Electrical Engineering from Rice University, Houston, Texas. She was on the ECE faculty at the University of Massachusetts/Amherst and initiated MOCVD, compound semiconductor materials and devices programs. Since the fall of 2000, she has been with the ECE Department at HKUST. She established the Photonics Technology Center for R&D effort in III-V materials, optoelectronic, high power, and high-speed devices. Professor Lau is a Fellow of the IEEE, and a recipient of the US National Science Foundation (NSF) Faculty Awards for Women (FAW) Scientists and Engineers (1991) and Croucher Senior Research Fellowship (2008). She is an Editor of the IEEE EDL and Associate Editor of Applied Physics Letters.