

Progress of Photonic Crystal Slab Devices

T. Baba, T. Matsumoto, K. Nozaki and D. Mori
Dept. Electrical & Computer Eng., Yokohama National Univ.
79-5 Tokiwadai, Hodogayaku, Yokohama 240-8501, Japan

Photonic crystal (PC) slab is a well developed platform for dense photonic integration. We report the recent progress of nanolasers, slowlight waveguides, and negative refractive optics. A point-shift PC nanolaser [1] now operates at room temperature under cw condition with a modal volume of $< 0.2(\lambda/n)^3$ and a sub- μW order threshold. Besides, the near-thresholdless operation and active/passive integration [2] are obtained, respectively, by the Purcell effect and the MOCVD butt joint regrowth process. Slowlight has become a major topic for PC waveguide. Narrow bandwidth and large group velocity dispersion are two important issues to be managed [3]. By the photonic band engineering and/or a chirped PC structure, dispersion-free slowlight of $\sim c/50$ is obtainable in a 1% bandwidth of the mid frequency. Negative refraction is another topic being studied extensively. In the PC slab, the prism and lensing effects are now clearly observed at lightwave frequencies [4].

- [1] K. Nozaki and T. Baba, Appl. Phys. Lett. **88**, 211101 (2006)
- [2] H. Watanabe and T. Baba, Electron. Lett. **42**, 695 (2006).
- [3] D. Mori and T. Baba, Opt. Express **13**, 9398 (2005).
- [4] T. Matsumoto, K. Eom and T. Baba, Opt. Lett. **31**, 2776 (2006).