

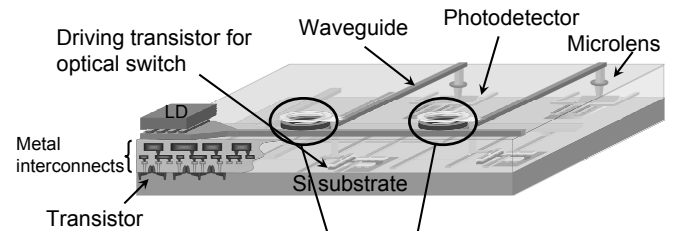
Ring Resonator Optical Switches for Interconnection on Si Chips

Yuichiro Tanushi and Shin Yokoyama

Research Center for Nanodevices and Systems,
Hiroshima University, Japan

Si LSI with Optical Interconnects

Si based light emitting devices are difficult to be realized.

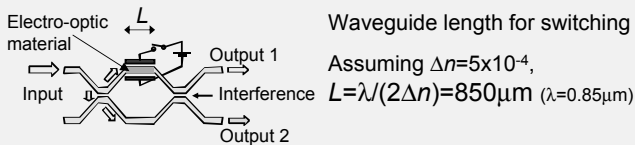


Integrate many ring resonator switches instead of LDs

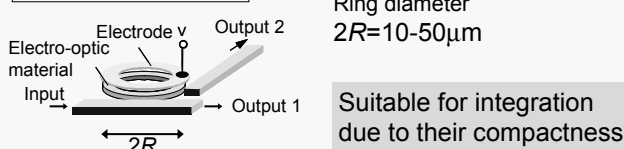
Monolithic Integration except for light emitting devices

Advantage of Ring Resonator Switches

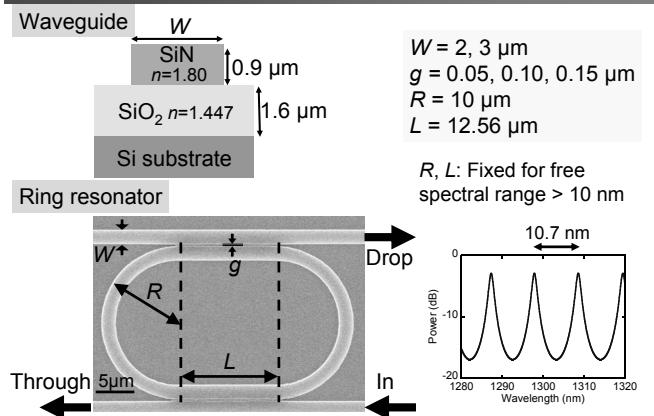
Mach-Zehnder interferometer type



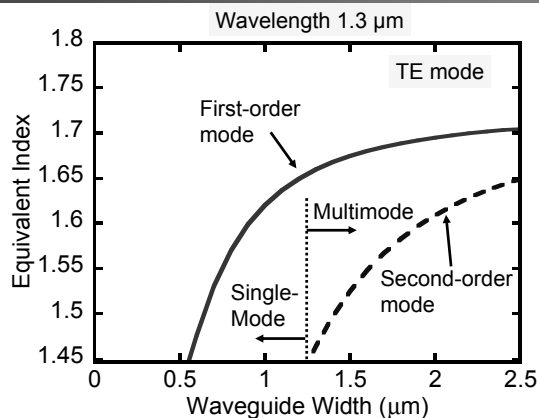
Ring resonator type



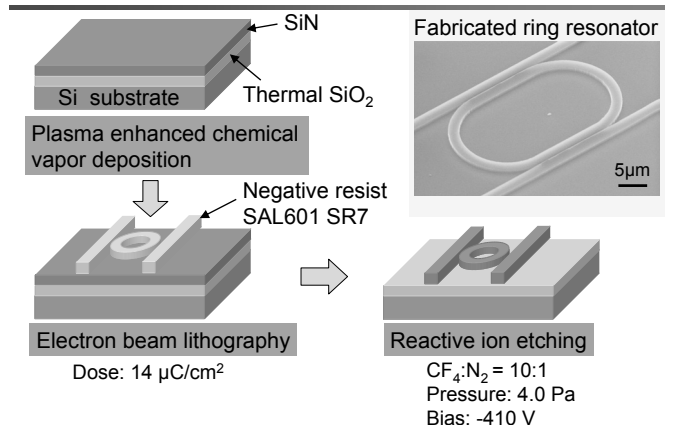
Device Parameters



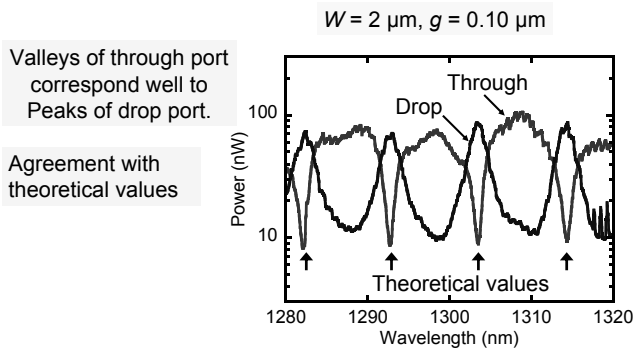
Single-Mode Condition



Fabrication Process

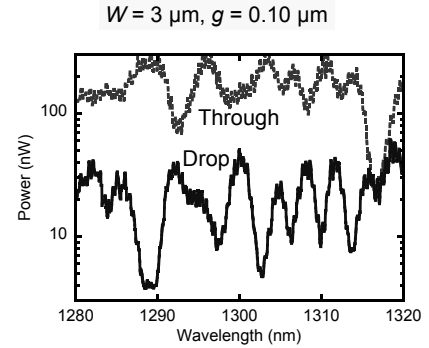


Resonance Characteristics

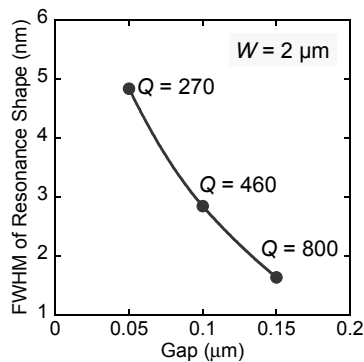


Multimode ring resonator behaves similarly to single-mode one.

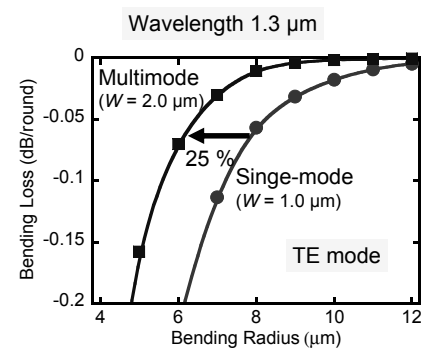
Resonance Characteristics



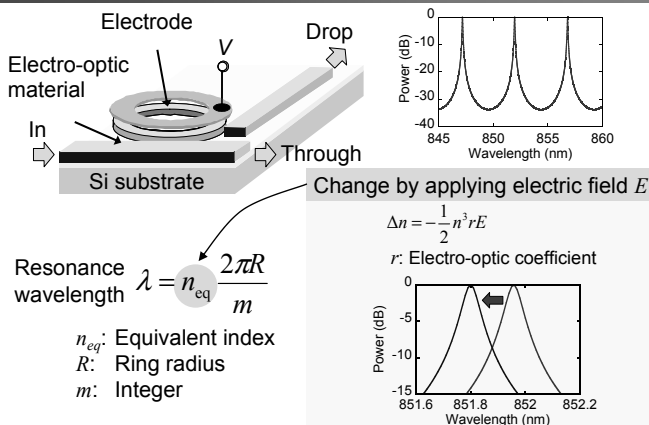
Gap Dependence of FWHM



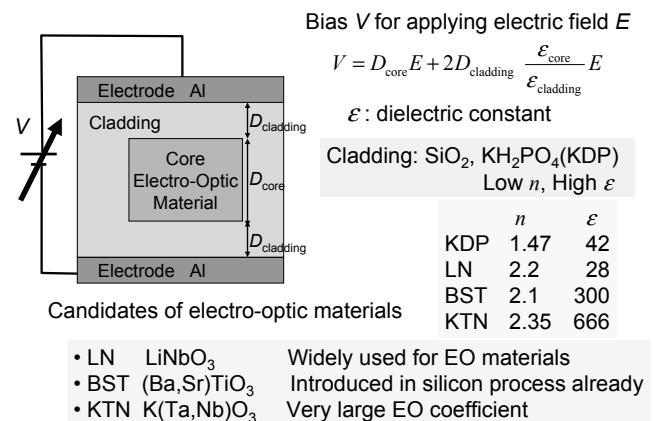
Simulation of Bending Loss



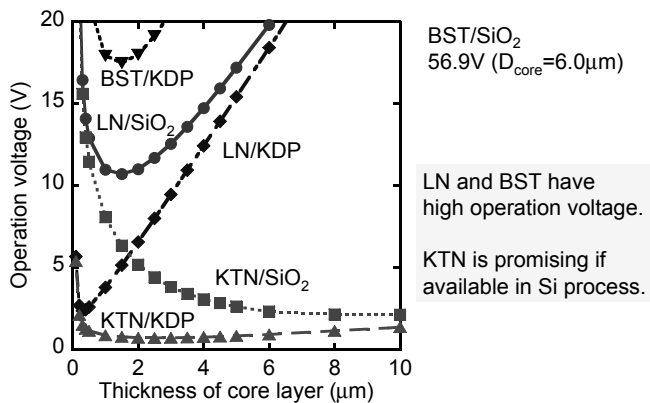
Principle and Application for Optical Switches



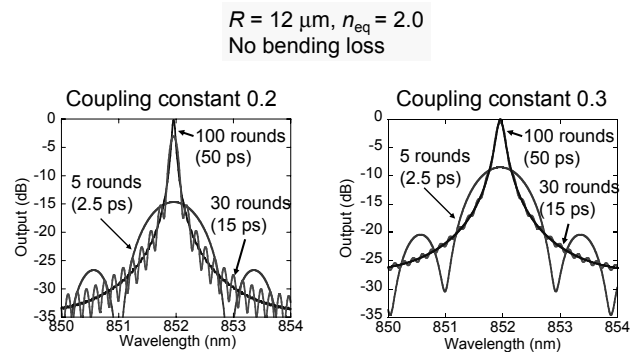
Cross Section of the Ring Resonator Switches



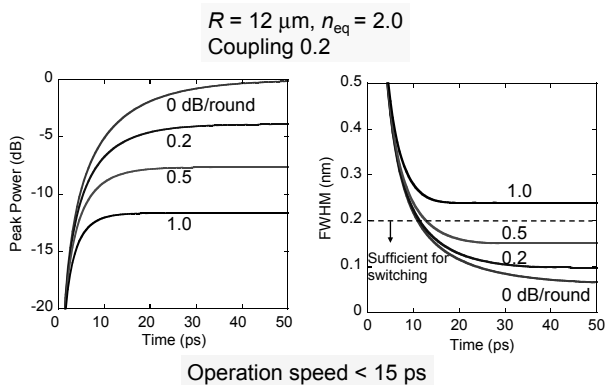
Operation Voltage



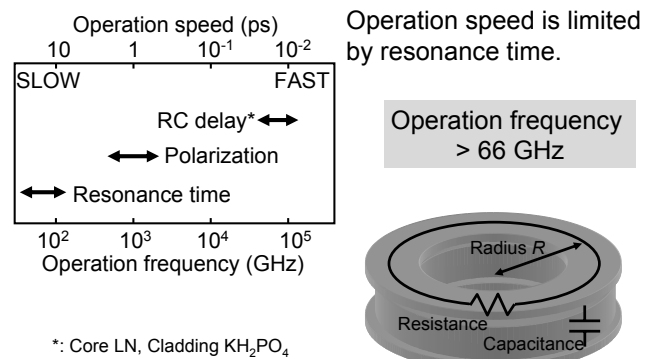
Time Dependence of Resonance Characteristics



Time Dependence of Peak Power and FWHM



Operation Speed



Conclusions

- We have fabricated multimode ring resonators. The resonance characteristics behaved similarly to those of single-mode ring resonators.
- The multimode ring resonators are useful for interconnection on Si chips.
- We proposed ring resonator optical switches using EO materials, which are promising devices for application to interconnection on Si chips.