Silica toroid microcavity coupled to silicon photonic chip

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Abstract
Efficient optical coupling to whispering gallery mode (WGM) microresonators is important for a wide range of applications. We experimentally demonstrated efficient optical coupling between low-index silica whispering gallery mode microresonator with high-index silicon chip. We can minimize the phase index mismatch by using photonic crystal waveguide (PhC-WG) as a coupler.

Background

- **WGM resonator**
- **Tapered fiber**
- **Planar waveguide coupler**

**Motivation**

The n_eff of an air-bridged PhC-WG is close to that of a silica microtoroid, when the wavelength is close at the mode edge of the PhC-WG.

**Devices**

- **PhC-WG**

**Experimental Results**

- **Measurement setup**

**Experimental Results – Coupling efficiency**

- **Conclusion**

In this work, we report optical coupling between silica WGM microresonator and CMOS-compatible PhC-WG and demonstrate extremely highly coupling efficiency of higher than 99%. The phase-matching is achieved by the use of W0.98 PhC-WG. This result provides a robust method of ultrahigh-Q WGMs to be coupled with a high-index silicon photonics integrated platform.