In-fiber Optical Micro-resonators

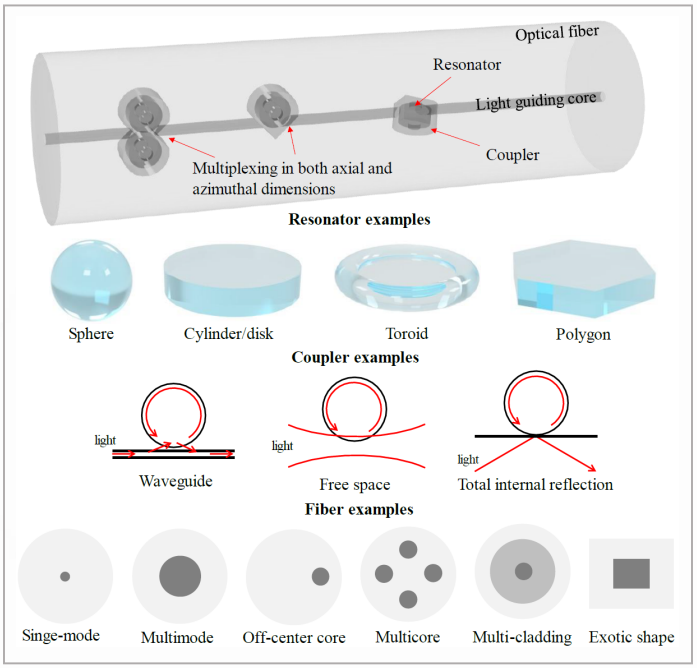
VTIP 21-055: “In-fiber Optical Micro-resonators”

THE CHALLENGE

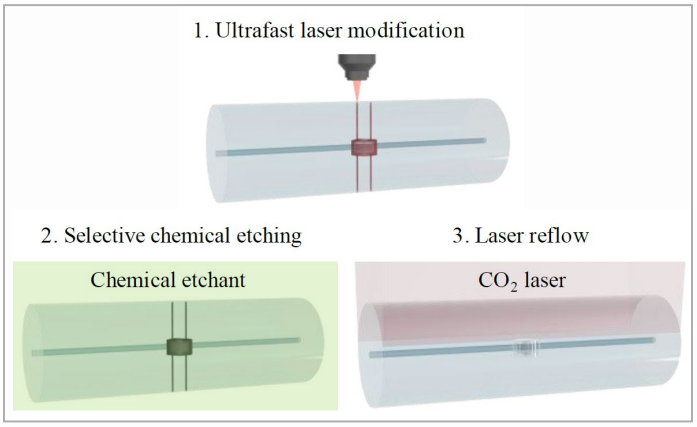
The global fiber optic market is estimated to be six billion dollars, and will only grow as our dependence upon high speed internet increases. Right now, fiber optics also provide necessary sensory data for ultrasound detection, temperature measurement, telecommunications, measurement of bio-chemical species, and a variety of other applications. Typically, micro-resonators necessary to boost the signals sent through the fibers are located outside the fibers, which results in more laborious fabrication of devices.

OUR SOLUTION

Anbo Wang and his team at Virginia Tech have developed a way to boost signals sent through fiber optic cables without the need for external resonator devices. This miniature fiber-optic device features self-contained optical micro-resonators and coupler structures. Each micro-resonator has the potential to serve multiple functions including the measurement of physical parameters, chemical properties, or biological species. They can also function as a spectral filtering element for telecommunication applications, such as frequency selection and optical switching. Additionally, these new micro-resonators can function within an optical nonlinear medium to generate light with new frequencies. The device is miniature and has high-aspect ratio, which is ideal for measurement that requires minimum intrusion, such as biomedical implants or probes. The devices are also made entirely of glass, ensuring chemical stability and bio-compatibility. Additionally, the laser micro-machining process used to fabricate the resonators is commonly used and easy to scale up.



Schematic illustration of the in-fiber micro-resonators and examples of potential designs for the resonator, coupler, and fiber.



Key steps in the fabrication process of the in-fiber micro-resonators.

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