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Silicon Nitride microdisk resonators as refractometric sensors in water

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Optical microdisks are intriguing devices due to their small size, compatibility with standard planar micro/nano-fabrication techniques, and ability to support high-Q whispering gallery modes. We fabricate and explore the use of thin (130 nm) Si_3N_4 disks with diameters of 15 - 30 μm as refractive index sensors, using a dimpled-tapered fiber to couple with the optical modes under water. The thin disks cause evanescent fields to extend far into the surrounding medium, providing large shifts of > 200 nm/refractive index units (RIU) of the optical modes in response to Lithium salts added to the environment. Loaded quality factors of $\sim 10^4$ let the resonant frequencies to be determined with great accuracy, providing a limit of detection near 10^{-6} RIU, comparable with state-of-the-art RI sensors.

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