Whispering-gallery microresonators can be used for sensitive optical detection of atmospheric trace gases and chemicals in solution. For example, light traveling down a tapered optical fiber tangent to the equator of a sub-millimeter silica microsphere can couple into a whispering-gallery mode, where it propagates many thousands of times around the sphere by total internal reflection. The evanescent component of such a mode interacts with the molecules to be detected in the ambient or on the sphere’s surface. I will discuss the sensors developed by my group, explain the advantages of our absorption detection scheme over others such as frequency-shift and cavity-ringdown, and illustrate novel applications such as sensitive detection of chemicals in a very strongly absorbing solvent and use in microfluidic liquid chromatography.

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