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A Novel Diffuse Reflecting Material for Applications in Integrating Cavity Spectroscopy MICHAEL CONE, Texas A&M University, JOSEPH MUSSER, Stephen F. Austin State University, JOHN MASON, ELEONORA FIGUEROA, JOEL BIXLER, BRETT HOKR, CHASE WINKLER, VLADISLAV YAKOVLEV, EDWARD FRY, Texas A&M University — Integrating cavities are a common and indispensable tool in the modern optics laboratory. The diffuse reflecting walls of the cavity allow it to collect and spatially integrate the radiant flux emitted from a source, making them ideal for applications in radiometry and photometry. In addition, integrating cavities have also been used to make very sensitive absorption measurements. Recently, we have developed a new diffuse reflecting material with the highest diffuse reflectivity ever measured in the visible and UV portions of the spectrum. The material is a packed fumed silica powder (i.e. quartz powder), and can be used to make high-reflectivity integrating cavities. We have used these quartz powder cavities in a variety of spectroscopic applications including: the detection of organic toxins via Raman spectroscopy, the detection of water contaminants through fluorescence spectroscopy, and measurements of the absorption coefficient of pure water in the UV. Furthermore, we have developed a variation of cavity ring-down spectroscopy (CRDS) that we call integrating cavity ring-down spectroscopy (ICRDS). ICRDS allows for direct measurements of the absorption in a sample, even in the presence of strong scattering. Currently, the commercially available diffuse reflectors have insufficient reflectivity for ICRDS, but our high-reflectivity fumed silica cavities have made ICRDS a reality.

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