AMPLIFIED FIBER-LOOP RINGDOWN SPECTROSCOPY

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Many commercial liquid chemical analysis systems, such as high-performance liquid chromatography (HPLC) or capillary electrophoresis consist of a separation followed by optical detection. Besides small volumes and low detection limits, the system should also allow the detection of a large variety of analytes. Existing absorption and fluorescence detectors are often not very sensitive or require labelling.

Here, an absorption detector is presented based on cavity ring-down spectroscopy (CRDS) where the optical cavity is made from fibre optic waveguides and the light source is a continuous wave (cw) diode laser. The purpose of this project is to increase the detection of analytes through their overtone absorption in the telecom region at 1300 to 1500 nm. This is done by increasing the ratio of desired loss (extinction caused by the sample), to undesirable loss (due to the waveguides or solvents) through amplification of the ringdown signal using a gain-clamped erbium doped fibre amplifier (EDFA). The amplified cavity has a round-trip time of 750 ns and we achieved a detection limit of at most 250 ppm when measuring acetylene at 1532.83 nm. The application of our method to detection of dissolved analytes or particles in liquids will be discussed.