



## Using Cavity Ring-Down Spectroscopy for the detection of food fraud

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In 1988 a new spectroscopic absorption measurement technique called Cavity Ring-Down Spectroscopy (CRDS) was introduced by O'Keefe and Deacon. The CRDS allows the measurement of stable isotope because of its very high sensitivity. Contrary to the currently common spectroscopic methods it is a robust and cost-effective alternative. The GfL - Gesellschaft für Lebensmittel-Forschung mbH in Berlin will use this type of stable isotope analysis to verify the authenticity of foods especially for fruit juice. This will require a lot of new and exciting development approaches.

The cavity ring-down spectroscopy uses an optical resonator consisting of two highly reflective mirrors in which the light of a laser is reflected back and forth. The decay rate of the laser light with and without analyte is measured against the time to determine its related concentration. On the one hand the determination of the cavity ring-down time makes the measurement independent of fluctuations in intensity of the light source, on the other hand effective absorption lengths up to 20 km can be achieved. This leads to a very high sensitivity of the cavity ring-down spectroscopy over other direct absorption spectroscopy methods. The determination of very small absorption coefficient allows the measurement of stable isotopes such as  $^{12}\text{C} / ^{13}\text{C}$  or  $\text{D} / \text{H}$  in form of carbon dioxide or water in the gas phase.

The potential of the stable isotope analysis in food chemistry lies in examining the authenticity, therefore the detection of origin and adulteration of food. The GfL - Gesellschaft für Lebensmittel-Forschung mbH as a proven and well established specialist in the analysis of fruit juices aligns its primary research approach to the falsification of juices by extraneous water, and the addition of acids and sugars of any botanical origin. First results predict the high potential of CRDS. It could be shown that it is possible to distinguish between cane and beet sugar and that the measured values of carbon isotopes by CRDS are similar to classic Isotope Ratio Mass Spectroscopy.

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