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# Measurement Science and Technology

## Performance assessment of a cavity ring-down laser spectrometer: achieving better precision and accuracy in the measurement of δ18O and δ2H in liquid water samples

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**Abstract**

The development of new isotopic laser-based analyzers currently represents a clear alternative to conventional isotope ratio mass spectrometers. However, this analytical technique also suffers some disadvantages such as the memory effect, problems related to the overall stability of the equipment and other issues associated with the injection system, essentially regarding the syringe's longevity. This paper aims to minimize these disadvantages in order to increase the overall performance, in terms of precision and accuracy, of these kinds of analyzers. The main results of the experiments carried out in this paper have shown that: (i) the minimum number of discarded injections needed to eliminate the memory effect can be determined just considering the expected isotopic signature difference between two consecutive samples; (ii) both accuracy and precision of the isotopic measurements increase with increasing injection volume up to 2.1–2.2 μL; (iii) it is possible to extend the syringe lifetime by almost a factor of 6 by using *n*-methyl 2-pyrrolidone as a lubricant. Besides, it has been concluded that, by using the appropriate procedure, the main disadvantages associated with CRDS laser spectroscopy analyzers can be minimized, achieving measurement accuracy and precision of the order of ±0.05 ‰ for $\delta^{18}O$ and ±0.3 ‰ for $\delta^{2}H$.