



Benefits of Purge and Trap Technology for Multielemental Stable Isotopic Analysis

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Elementar has a range of elemental analysers that can be interfaced to stable isotope ratio mass spectrometers for bulk stable isotopic and elemental analysis. The vario cube series of elemental analysers utilize purge and trap chromatography to separate gases produced during combustion and pyrolysis prior to isotopic analysis or elemental analysis. Purge and trap chromatography provides complete baseline resolution of nitrogen, carbon dioxide and sulfur dioxide even in cases of extremely high C:N or C:S ratios. In combination with the Isoprime100 stable isotope ratio mass spectrometer, simultaneous nitrogen, carbon and sulfur isotopic analysis is possible in 10 minutes with no compromise in precision. We provide examples of NCS sample analysis of organic samples (wheat, feather, pollen and casein) with a precision generally better than 0.1, 0.05 and 0.1 per mil for nitrogen, carbon and sulphur isotopic analysis, respectively. In order to optimize the standard vario elemental analyzers for NCS isotopic analysis, specific modifications to the water removal tube and reduction tube were incorporated in order to reduce S memory. The modifications included a separate reduction tube with a reduced zone of copper and a water removal tube that attaches directly to the top of the reduction tube. Repeat analyses of sulfanilic acid and cysteine that differ by 8 per mil demonstrate the S memory with the new configuration is very low. In addition to increased throughput, purge and trap technology provides increased sensitivity for carbon and sulphur since the peaks are much sharper than peaks separated on a conventional elemental analyser utilizing isothermal gas chromatography. A specific example of sulphur isotopic analysis of archaeological bone collagen demonstrates that an eight-fold increase in sensitivity is possible with purge and trap technology in comparison to traditional isothermal gas chromatography. With purge and trap chromatography it was possible to analyse NCS isotopes on collagen samples as small as 2mg. Not only is simultaneous NCS isotopic analysis possible because of purge and trap technology, but also provides distinct advantages in the case of sample size limitations, decrease time spent weighing samples and increase throughput.