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Water enriched in the rare stable isotopes

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Propositions

Propositions belonging to the PhD thesis:

Water enriched in the rare stable isotopes Preparation, measurement and applications

Vahideh Faghihi

1. A new high-quality set of enriched reference waters with unprecedented quality to help doubly labelled water (DLW) laboratories to accurately calibrate their unknown enriched waters is now available (Chapter 4).
2. Accurate characterization of the commercial ^2H - and ^{18}O -enriched waters is a crucial step in the preparation procedure of enriched reference waters (Chapter 4).
3. In spite of claims by the manufacturers that the isotopic abundances of the non-enriched side of their commercial ^2H - and ^{18}O -enriched waters are "natural", they can be substantially enriched (Chapter 4).
4. A thoroughly validated spreadsheet is now available for calculating the isotopic abundances and respective isotope delta values for ^2H , ^{17}O and ^{18}O for mixtures of waters with arbitrary isotopic compositions specified either in terms of the delta values or isotopic abundances (Chapter 5).
5. Laser spectrometry, along with reliable calibration standards, offers low-cost, fast, and accurate analyses of the doubly labelled water (DLW) samples as well as triply labelled water (TLW) samples due to its ability to measure ^{17}O (Chapter 3).
6. The uncertainty in the correction for isotope effects on the triple point of water (TPW) temperature in triple point cells used around the world has been improved to $< 1 \mu\text{K}$, which is negligible compared to the uncertainty in the temperature measurement (chapter 7).
7. Improved accuracy and reproducibility of the TPW temperature will lead to both a general higher quality of temperature measurement, and to a higher quality of the realization of the kelvin according to the SI definition, which is crucial for future work on redefinition of the kelvin based on Boltzmann's constant (Chapter 6 and 7).
8. Success without value is not valued. Success is about what you have earned and value is about what you are giving to the world from what you earned.