

CARBON-13 LABELLED SODIUM BICARBONATE

Comprising two samples; ~ 100 and ~ 450 ‰ ¹³C vs VPDB

BACKGROUND

The increasing application of stable isotopes as tracers in medical, biological and agricultural studies has focused interest on the need for reliable analytical measurements.

One of the topics of current interest in human metabolic research is the metabolism of carbohydrates, fatty acids, sugars and other C-containing compounds of dietary interest. ¹³CO₂ breath gas analysis, in particular, has become an important tool in clinical diagnostic research to obtain specific information about gastric diseases, fat malabsorption, bacterial overgrowth and intolerance problems. In this connection there is a need for reliable analytical measurements of expired carbon dioxide and organically-bound carbon in biological material.

An important requirement in such work is the application of appropriate analytical quality control procedures based, in part, on the use of certified reference materials. Although several laboratory control samples are now in common use by some analysts, none is yet available that can be regarded as an ideal reference material for checking the accuracy and precision of different analytical methods at the levels of enrichment needed for medical and biological tracer studies. It is hoped that the IAEA enriched stable isotope reference materials described in this reference sheet will to some extent fulfil this role.

TYPE OF MATERIAL AND UNIT SIZE

0.36N Na-¹³C-bicarbonate solution in two separate vials each containing ~ 3 ml solution.

ENRICHMENT VALUES TO BE DETERMINED

Enrichments should be determined in terms of the "δ-value" ‰ (per mille deviation in isotope ratio) relative to VPDB (Vienna Pee Dee Belemite).

Most laboratories engaged in stable isotope analysis of ¹³C employ their own internal reference materials, which have been carefully calibrated with respect to VPDB, which no longer exists. VPDB is now defined in relation to the existing reference material NBS19 calcium carbonate (also called TS-Limestone) by the relation:

$$\delta^{13}\text{C}_{\text{NBS19/VPDB}} = + 1.95 \text{ ‰}$$

RECOMMENDED VALUES

Sample	Isotope	Enrichment* per mille	95% Confidence Interval
303A	^{13}C	93.3	91.1 - 95.4
303B	^{13}C	466	460 - 472

* vs VPDB

PREPARATION

Two sodium bicarbonate reference materials were prepared from $\text{NaH}^{13}\text{CO}_3$ (isotopic purity ~ 99 atom percent), made up in distilled water and assayed for total CO_2 by acidification in a vacuum line and manometric assay.

ORDERING INFORMATION

Orders should be submitted on the order form at the back of the current AQCS Catalogue [1]. Samples IAEA-303A and IAEA-303B are only available as a pair - they may NOT be ordered separately.

EVALUATION REPORT

A full report on the results of the intercomparison on which the recommended values are based is available upon request [2].

ACKNOWLEDGEMENTS

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CONTACT ADDRESS

Any enquiries concerning the reference materials described in this reference sheet, or new results, should be addressed to:

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RELATED IAEA REFERENCE MATERIALS

IAEA-309 UL-Glucose (2 samples; ~ 100 and ~ 550 ‰ ^{13}C vs VPDB)

REFERENCES

1. AQCS, Analytical Quality Control Services, IAEA, Vienna (issued annually in January).
2. Parr, R.M., Clements, S.A., Intercomparison of enriched stable isotope reference materials for medical and biological studies, NAHRES-5, IAEA, Vienna, 1991.

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