

United States Geological Survey

Reston Stable Isotope Laboratory

Report of Stable Isotopic Composition

Reference Material LSVEC

(Carbon and Lithium Isotopes in Lithium Carbonate)

This reference material (RM) is intended for calibration of stable carbon ($\delta^{13}\text{C}$) and lithium isotopic abundance measurements of unknown carbon- and lithium-bearing substances. This RM is issued in containers with 0.5 g of LSVEC lithium carbonate. This RM was prepared by H. Svec, Iowa State University [1], originally to be used as a reference material for lithium isotopic composition. This RM may also be available from the U.S. National Institute of Standards and Technology (NIST) [2] as RM 8545 or from the International Atomic Energy Agency (IAEA) [3].

Recommended Values: Stable carbon isotopic compositions are expressed herein as delta values [4] relative to VPDB (Vienna Peedee belemnite) on a scale normalized such that the $\delta^{13}\text{C}$ values of NBS 19 calcium carbonate and LSVEC lithium carbonate are +1.95 ‰ and -46.6 ‰, respectively [5]. Thus, LSVEC serves by consensus [5] as one of the anchors of the VPDB-LSVEC stable carbon isotope scale. The carbon and lithium isotopic composition of LSVEC are:

Stable carbon isotopic composition: $\delta^{13}\text{C}_{\text{VPDB-LSVEC}} = -46.6 \text{ ‰ exactly}$ [5]

Lithium isotopic abundance: $N(^6\text{Li}) / N(^7\text{Li}) = 0.08215 \pm 0.00023$ [6]

LSVEC should not be used as a RM for oxygen isotopes because it is ground very finely and its oxygen isotopic composition can change by exchange of oxygen with atmospheric moisture, which also was the case for NBS 20, prepared from Solenhofen limestone. NBS 20 was removed from distribution by the IAEA because it also was ground too finely and its oxygen isotopic composition changed with time due to exchange with atmospheric moisture [7].

Expiration of Reference Value: The reference value for the isotopic composition of LSVEC is valid for a period of 10 years, provided the RM is handled in accordance with the instructions given in this Report of Stable Isotopic Composition (see “Instructions for Use”). The reference value is nullified if the RM is damaged, contaminated, or otherwise modified.

Technical coordination for this RM was provided by Haiping Qi of the RSIL.

Maintenance of RM Certification: The Reston Stable Isotope Laboratory (RSIL) will monitor this RM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this report, the RSIL will notify the purchaser.

Distribution and Stability: LSVEC is stable at normal room temperatures. To minimize the potential for contamination, it is recommended that this RM be stored in the container in which it is supplied.

Instructions for use: For lithium isotopic ratio measurement, the method described in Qi and others [6,8] can be used. For $\delta^{13}\text{C}$ measurements, reaction of carbonates with 100 % phosphoric acid using the method of McCrea [9] or one of the improved phosphoric acid techniques can be used (for example, see Brand and others [10]).

Reporting of Stable-isotope-delta Values: The following recommendations are provided for reporting stable carbon isotope-delta values. It is recommended that:

- The $\delta^{13}\text{C}$ values of all carbon-bearing substances be expressed relative to VPDB on a scale such that the $\delta^{13}\text{C}$ values of NBS 19 calcium carbonate and L-SVEC lithium carbonate are +1.95 ‰ and -46.6 ‰, respectively [5,11].
- Authors report δ values of international distributed (secondary) isotopic reference materials as though they had been interspersed among and used for normalization of unknowns, as appropriate for the measurement method. In this manner, measurement results can be adjusted in the future as analytical methods improve and consensus values of internationally distributed isotopic reference materials change.
- Reporting of δ values relative to PDB (Peedee belemnite) be discontinued [12].

REFERENCES

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