

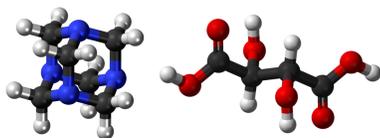
ISO-TOPICS: THE FIRMS NETWORK NEWSLETTER

October 2021

ABOUT US

The Forensic Isotope Ratio Mass Spectrometry (FIRMS) Network was founded to develop the scope of stable isotope techniques in forensic applications.

FIRMS brings together chemists, physicists, materials scientists, and life scientists who employ isotopic analysis in their respective fields. FIRMS is helping to focus collective knowledge and expertise on improving methods for crime detection and reduction.



The 2022 round of the FIRMS Network's annual PT scheme will include the materials hexamine and tartaric acid. Participation is free for Institutional members of FIRMS.

WELCOME

Welcome to the FIRMS October 2021 newsletter.

DISCLAIMER

Reference to or mention of any commercial product or process by specific trademark or manufacturer within this newsletter does not necessarily represent an endorsement by the FIRMS Network.

PROFICIENCY TESTS

In addition to its annual Proficiency Testing (PT) Scheme involving one round of analyses of two materials, the FIRMS network will be offering a case-based proficiency test next year.

The scenario will involve polymer-based physical evidence and will require the comparison of two or more exhibits by whatever methods the laboratory feels appropriate. Laboratories will be expected to provide a report in their usual format. Reports will be anonymised and sent to a member of the FIRMS Steering Group to compile a summary that will be circulated to all participants.

The FIRMS Network will offer a case-based proficiency test in January 2022.

There will be no charge for this case-based exercise, but it is limited to FIRMS Institutional or Individual members. Expressions of interest must be received by 1 December 2021 so that the samples can be prepared.

The 2022 round of the FIRMS Network's annual PT Scheme will include the materials hexamine and tartaric acid. A second round will include the materials honey, olive oil, and wine. Participation in the first round is complementary for FIRMS Institutional Members. Participation in the optional second round will incur a fee.

UPDATES FROM THE STEERING GROUP

The Steering Group has a new Chair, **Helen Salouros** (National Measurement Institute, Australia). In turn, **Phil Dunn** has replaced Jim Carter as Treasurer. We are actively recruiting a back-up and replacement **Membership Officer**; please contact a member of the Steering Group if interested.

The FIRMS Network has a **new Institutional Member**, the Alaska Stable Isotope Facility. Matthew Wooller has joined the Steering Group as its representative. Welcome, Matthew!

At the Annual General Meeting, the Steering Group bid a fond farewell to **Gerard van der Peijl**, who is retiring from the Netherlands Forensic Institute at the end of 2021. Gerard joined the FIRMS Network in 2002. Please join us in thanking him for his years of service to the organization. Best wishes for a relaxing retirement, Gerard!

Gerard van der Peijl is retiring from the Netherlands Forensics Institute and leaving the FIRMS Network after 19 years. Best wishes, Gerard!

The Steering Group formed a planning committee for the 8th FIRMS Network Conference, which will take place virtually in October 2022. Committee members include Helen Salouros, Kylie Jones, and Lesley Chesson. Please reach out with questions or suggestions.

NEWS AND NOTICES

LSVEC and the VPDB carbon isotope delta scale

As many of you might know, the IAEA and others have uncovered a stability issue with the LSVEC lithium carbonate reference material resulting from exchange of carbon with atmospheric CO₂ leading to variations in isotope delta values of up to 0.35 ‰ (Assonov 2018, Assonov et al. 2021a, Qi et al 2021). LSVEC has therefore been withdrawn as a carbon isotope ratio reference material (CIAAW 2018).

This creates an issue given the recommendation that all carbon isotope delta values on the VPDB scale should be normalised using NBS 19 and LSVEC, each with exactly-assigned isotope delta values (Coplen et al. 2006) – LSVEC clearly does not have an exact carbon isotope delta value. The IAEA has therefore recently released a new

suite of carbonate reference materials that could provide the basis of a new means to normalise results – by using two or more of those carbonates (Assonov et al. 2021a, b).

Unfortunately, this new approach to normalise carbon isotope delta values has been shown to result in biased isotope delta values relative to those following the 2006 recommendation (Hélie et al. 2021). This bias is of the order of 0.2 ‰ at approximately $\delta^{13}\text{C}_{\text{VPDB}} = -45$ ‰ but decreases as carbon isotope delta values trend towards 0.

Given this bias, care must be taken when comparing isotope delta values normalised using reference materials with traceability to VPDB that have LSVEC within their traceability chain to those normalised to VPDB using the new IAEA carbonates or other reference materials that do not have LSVEC within their traceability chain.

HIGHLIGHTED PUBLICATIONS

A recent news story of interest involved Shelby Houlihan, an American distance runner who holds records at 1,500-m and 5,000-m. On 11 June 2021 she was banned for 4 years following a positive test for 19-norandrosterone, a metabolite of the banned anabolic androgenic steroid nandrolone. Houlihan's explanation for the positive test was ingestion of offal from an uncastrated boar served by a local food truck. The defense claimed that the laboratory did not prove that the result was not from ingestion of uncastrated boar offal, and that the measured carbon isotope delta value of -23 ‰ was likely in this scenario (despite the common fodder for pork in the United States being corn-based). On 1 September 2021, the Court of Arbitration of Sport upheld the ban after an appeal, saying "The explanation presupposes a cascade of factual and scientific improbabilities, which means that its composite probability is (very) close to zero." (<https://bit.ly/3nv4bWX>)

References included in the statement on LSVEC and the VPDB carbon isotope delta scale (above) can be found in the publications list (below).

Phil Dunn and co-authors recently published “Guidance for characterization of in-house reference materials for light element stable isotope analysis” (10.1002/rcm.9177).

Version 1.1 of the *FIRMS Guidance for the Forensic Interpretation of Isotope Ratio Data* is now available. You can download a copy from the website (forensic-isotopes.org).

PUBLICATIONS LIST

Disclaimer: This section contains a non-comprehensive list of recent publications that may be of interest to members. Inclusion does not necessarily mean that the FIRMS Network approves the content. You are encouraged to consider critically whether (i) the experimental work complies with SI guidelines and the Good Practice Guide; and (ii) the conclusions drawn are based on sound scientific background information.

Assonov S (2018) Summary and recommendations from the International Atomic Energy Agency Technical Meeting on the Development of Stable Isotope Reference Products (21-25 November 2016). *Rapid Communications in Mass Spectrometry* 32:827–830. <https://doi.org/10.1002/rcm.8102>

Assonov S, Fajgelj A, Allison C, Gröning M (2021a) On the metrological traceability and hierarchy of stable isotope reference materials aimed at realisation of the VPDB scale: Revision of the VPDB $\delta^{13}\text{C}$ scale based on multipoint scale-anchoring RMs. *Rapid Communications in Mass Spectrometry* 35(8). <https://doi.org/10.1002/rcm.9018>

Assonov S, Fajgelj A, Hélie J, et al (2021b) Characterisation of new reference materials IAEA-610, IAEA-611 and IAEA-612 aimed at the VPDB $\delta^{13}\text{C}$ scale realisation with small uncertainty. *Rapid Communications in Mass Spectrometry* 35(7). <https://doi.org/10.1002/rcm.9014>

Bontempo L, Bertoldi D, Franceschi P, et al (2021) Elemental and isotopic characterization of tobacco from Umbria. *Metabolites* 11(3). <https://doi.org/10.3390/metabo11030186>

Chesson LA, Berg GE (2021) The use of stable isotopes in postconflict forensic identification. *WIREs Forensic Science*. <https://doi.org/10.1002/wfs2.1439>

CIAAW (2018) Standard Atomic Weights of 14 Chemical Elements Revised. *Chemistry International* 40:23–24. <https://doi.org/10.1515/ci-2018-0409>

Coplen TB, Brand WA, Gehre M, et al (2006) New guidelines for $\delta^{13}\text{C}$ measurements. *Analytical Chemistry* 78:2439–2441. <https://doi.org/10.1021/ac052027c>

Cormick J, Carter JF, Currie T, et al (2021) A survey of amphetamine type stimulant nitrogen sources by isotope ratio mass spectrometry. *Forensic Chemistry* 26:100353. <https://doi.org/10.1016/j.forc.2021.100353>

Dunn PJH, Malinovsky D, Holcombe G, et al (2021) Guidance for characterization of in-house reference materials for light element stable isotope analysis. *Rapid Communications in Mass Spectrometry* 35(20). <https://doi.org/10.1002/rcm.9177>

Hélie J-F, Adamowicz-Walczak A, Middlestead P, et al (2021) Discontinuity in the realization of the Vienna Pee Dee Belemnite carbon isotope ratio scale. *Analytical Chemistry* 93:10740–10743. <https://doi.org/10.1021/acs.analchem.1c02458>

Krajnc B, Bontempo L, Luis Araus J, et al (2021) Selective methods to investigate authenticity and geographical origin of Mediterranean food products. *Food Reviews International* 37:656–682. <https://doi.org/10.1080/87559129.2020.1717521>



This newsletter was compiled and edited by Lesley Chesson. It was created using a Microsoft® Word template.

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Murphy BJ, Carlson RE, Howa JD, et al (2021) Determining the authenticity of methyl salicylate in *Gaultheria procumbens* L. and *Betula lenta* L. essential oils using isotope ratio mass spectrometry. *Journal of Essential Oil Research*. <https://doi.org/10.1080/10412905.2021.1925362>

Pianezze S, Camin F, Perini M, et al (2021) Tracing lamb meat with stable isotope ratio analysis: A review. *Small Ruminant Research* 203:106482. <https://doi.org/10.1016/j.smallrumres.2021.106482>

Qi H, Moossen H, Meijer HAJ, et al (2021) USGS44, a new high purity calcium carbonate reference material for $\delta^{13}\text{C}$ measurements. *Rapid Communications in Mass Spectrometry* 35(4). <https://doi.org/10.1002/rcm.9006>

Ricciardi M, Pironti C, Motta O, et al (2021) Investigations on historical monuments' deterioration through chemical and isotopic analyses: An Italian case study. *Environmental Science and Pollution Research*. <https://doi.org/10.1007/s11356-021-15103-x>

Salouros H (2021) Synthetic origin of illicit methylamphetamine in Australia: 2011–2020. *Drug Testing and Analysis*. <https://doi.org/10.1002/dta.3117>

Terzer-Wassmuth S, Wassenaar LI, Welker JM, Araguás-Araguás LJ (2021) Improved high-resolution global and regionalized isoscapes of $\delta^{18}\text{O}$, $\delta^2\text{H}$ and *d*-excess in precipitation. *Hydrological Processes* 35(6). <https://doi.org/10.1002/hyp.14254>

Valenzuela LO, O'Grady SP, Ehleringer JR (2021) Variations in human body water isotope composition across the United States. *Forensic Science International* 327:110990. <https://doi.org/10.1016/j.forsciint.2021.110990>

Wooller MJ, Bataille C, Druckenmiller P, et al (2021) Lifetime mobility of an Arctic woolly mammoth. *Science* 373:806–808. <https://doi.org/10.1126/science.abg1134>