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Literature Survey on Isotopic Abundance Ratio Measurements - 2001-2005

Norman E. Holden

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Brookhaven National Laboratory
P.O. Box 5000
Upton, NY 11973-5000
www.bnl.gov

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Norman E. Holden
National Nuclear Data Center
Brookhaven National Laboratory
Upton, New York 11973-5000

Introduction

Along with my usual weekly review of the published literature for new nuclear data, I also search for new candidates for best measurements of isotopic abundances from a single source. Most of the published articles, that I previously had found in the Research Library at the Brookhaven Lab, have already been sent to the members of the Atomic Weights Commission, by either Michael Berglund or Thomas Walczyk. In the last few days, I checked the published literature for any other articles in the areas of natural variations in isotopic abundance ratios, measurements of isotopic abundance ratios on samples of extra-terrestrial material and isotopic abundance ratio measurements performed using ICPMS instruments. Hopefully this information will be of interest to members of the Commission, the sub-committee on isotopic abundance measurements (SIAM), members of the former sub-committee on natural isotopic fractionation (SNIF), the sub-committee on extra-terrestrial isotope ratios (SETIR), the RICE Task Group and the Guidelines Task Group, who are dealing with ICPMS and TIMS comparisons.

In the following report, I categorize the publications in one of four areas. Measurements performed using either positive or negative ions with Thermal Ionization Mass Spectrometer, TIMS, instruments; measurements performed on Inductively Coupled Plasma Mass Spectrometer, ICPMS, instruments; measurements of natural variations of the isotopic abundance ratios; and finally measurements on extra-terrestrial samples with instrumentation of either type. There is overlap in these areas. I selected out variations and ET results first and then categorized the rest of the papers by TIMS and ICPMS.

The time frame that I chose to search the literature was for publication dates from July 2001, at the time of the SIAM and the Commission meetings of the Brisbane General Assembly, until the present time. As a result, there may be some papers in the list, which were reviewed earlier (if we had a preliminary unpublished result at Brisbane). At this point, I did not have the time to check out the minutes of the SIAM meeting in Brisbane to filter these papers out.

Since there are almost one hundred of these papers, I will not be bringing any of the papers with me to the Beijing meeting. The major journals quoted below are given a short hand of: JMS – Journal of Mass Spectrometry; GCA – Geochimica Cosmochemica Acta; SCI – Science; and EPSL – Earth Planetary Science Letters.

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TIMS

1. Russe et al, "Synthetic isotope mixtures for the calibration of isotope amount ratio measurements of carbon", JMS 235 pp 235 (2004).

2. Aregbe et al, "A method to induce and assess isotopic equilibrium of oxygen", JMS 214 pp 233 (2002).

3. Valkiers et al, "Silicon isotope amount ratios and molar masses for two silicon isotope reference materials: IRMM-018a and NBS28", JMS 242 pp 319 (2005).

4. Pritzkow et al, "Determination of sulfur isotope abundance ratios for SI-traceable low sulfur concentration measurements in fossil fuels by ID-TIMS" JMS 242 309 (2005).

5. Valkiers et al, "Absolute sulfur isotope amount ratios in two batches of high purity SO_2 gas: sulfur reference materials IRMM-2012 and IRMM-2013", JMS 242 pp 303 (2005).

6. Ding et al, "Calibrated sulfur isotope abundance ratios of three IAEA sulfur isotope reference materials and V-CDT with a reassessment of the atomic weight of sulfur", GCA 65 pp 2433 (2001).

7. Chang et al, "Absolute isotopic composition and atomic weight of zinc", JMS 208 pp 113 (2002).

8. de Laeter et al, "The isotopic composition and atomic weight of lanthanum", JMS 244 pp 91 (2005).

9. Chang et al, "Absolute isotopic composition and atomic weight of samarium", JMS 218 pp 167 (2002).

10. Chang et al, "Absolute isotopic composition and atomic weight of dysprosium", JMS 207 pp 13 (2001).

11. Suzuki et al, "Precise Re isotope ratio measurements by negative thermal ionization mass spectrometry (NTI-MS) using total evaporation technique", JMS 235 pp 97 (2004).

12. Briche et al, "Measurement of the isotopic composition and atomic weight of an isotopic reference material of platinum, IRMM-010", Analylica Chimica Acta 460 pp 41 (2002).

13. Richter et al, "Improved techniques for high accuracy isotope ratio measurements of nuclear materials using thermal ionization mass spectrometry", JMS 229 pp 181 (2003).

ICPMS

1. Magna et al, "Low blank isotope ratio measurement of small samples of lithium using multiple-collector ICPMS" JMS 239 pp 67 (2004).

2. Galy et al, "Mg isotopic composition of carbonate: insight from speleothem formation" EPSL 201 pp 105 (2002).

3. Zhu et al, "High precision measurement of titanium isotope ratios by plasma source mass spectrometry" JMS 220 pp 21 (2002).

4. Schoenberg et al, "An assessment of the accuracy of stable Fe isotope ratio measurements on sample with organic and inorganic matrices by high-resolution multi-collector ICP-MS" JMS 242 pp 257 (2005).

5. Mason et al, "High-precision Cu and Zn isotope analysis by plasma source mass spectrometry part 1. Spectra interferences and their correction", J. Anal. At. Spectrom. 19 pp 209 (2004).

6. Mason et al, "High-precision Cu and Zn isotope analysis by plasma source mass spectrometry, part 2. Correcting for mass discrimination effects", J. Anal. At. Spectrom. 19 pp 218 (2004).

7. Tanimizu et al, "Absolute isotopic composition and atomic weight of commercial zinc using inductively coupled plasma mass spectrometry" Ana. Chem. 74 pp 5814 (2002).

8. Weiss et al, "Isotopic discrimination of zinc in higher plants" New Phytologist 165 pp 703 (2005).

9. Waight et al, "Sr isotope ratio measurements by double-focusing MC-ICPMS: techniques, observations and pitfalls", JMS 221 pp 229 (2002).

10. Thirlwall et al, "Multi-dynamic isotope ratio analysis using MC-ICP-MS and the causes of secular drift in Hf, Nd and Pb isotope ratios", JMS 235 pp 59 (2004).

11. Albarede et al, "Precise and accurate isotopic measurements using multi-collector ICPMS", GCA 68 pp 2725 (2002).

12. Fehr et al, "Application of MC-ICPMS to the precise determination of tellurium isotopic compositions in chondrites, iron meteorites and sulfides", JMS 232 pp 83 (2004).

13. Segal et al, "Isotope ratio measurements of dysprosium by multiple collection inductively coupled plasma mass spectrometry", JMS 216 pp 177 (2002).

14. Boulyga et al, "Precise isotope analysis of natural and enriched osmium samples using different ICP-MS instruments", JMS 218 pp 245 (2002).

15. Weiss et al, "Accurate and precise Pb isotope ratio measurements in environmental samples by MC-ICP-MS", JMS 232 pp 205 (2004).

Variations

1. Abruzzese et al, "Oxygen and hydrogen isotope ratios in freshwater chert as indicators of ancient climate and hydrologic regime", GCA 69 pp 1377 (2005).

2. Leeman et al, "Boron isotopic variations in fumarolic condensates and thermal waters from Vulcano Island, Italy: Implications for evolution of volcanic fluids", GCA 69 pp 143 (2005).

3. Aggarwal et al, "The effect of instrumental mass bias on $\delta\ ^{11}B$ measurements: a comparison between thermal ionization mass spectrometry and multiple collector ICP-MS", JMS 232 pp 259 (2004).

4. Sonoda et al, "Boron isotope ratio measurements by negative thermal ionization mass spectrometry method using boron free seawater", Nuclear Science Technology 39 pp 295 (2002).

5. Straub et al, "The systematics of boron isotopes in Izu arc front volcanic rocks", EPSL 198 pp 25 (2002).

6. Huang et al, "Climate change as the dominant control on glacial-interglacial variations in C_3 and C_4 plant abundance" Sci. 293 pp 1647 (2001).

7. Zachos et al, "Rapid acidification of the ocean during the Paleocene-eocene thermal maximum", Sci. 308 pp 1611 (2005).

8. Tripati et al, "Deep sea temperature and circulation changes at the Paleocene-eocene thermal maximum", Sci. 308 pp 1894 (2005).

9. Miller et al, "Ecosystem collapse in Pleistocene Australia and a human role in megafaunal extinction", Sci. 309 pp 287 (2005).

10. Pagani et al, "Marked decline in atmospheric carbon dioxide concentrations during the paleogene", Sci. 309 pp 600 (2005).

11. Miller, "Isotopic fractionation and the quantification of ^{17}O anomalies in the oxygen three-isotope system: an appraisal and geochemical significance", GCA 66 pp 1881 (2002).

12. Luz et al, "The isotopic ratios $^{17}O/^{16}O$ and $^{18}O/^{16}O$ in molecular oxygen and their significance in biogeochemistry", GCA 69 pp 1099 (2005).

13. Bekker et al, "Dating the rise of atmospheric oxygen", Nature 427 pp 117 (2004).

14. Turchyn et al, "Oxygen isotope constraints on the sulfur cycle over the past 10 million years", Sci. 303 pp 2004 (2004).

15. Masson-Delmotte et al, "Grip Deuterium Excess reveals rapid and orbital-scale changes in Greenland moisture origin", Sci. 309 pp 118 (2005).

16. Galy et al, "High precision measurement of magnesium isotopes by multiple-collector inductively coupled plasma mass spectrometry", JMS 208 pp 89 (2001).

17. Ding et al, "Silicon isotope compositions of dissolved silicon and suspended matter in the Yangtze River, China", GCA 68 pp 205 (2004).

18. Kreissig et al, "Ca fingerprints of early crust-mantle evolution", GCA 69 pp 165 (2005).

19. Heuser et al, "Measurement of calcium isotopes ($\delta\ ^{44}Ca$) using a multi-collector TIMS techniques", JMS 220 pp 385 (2002).

20. Rouxel et al, "Iron isotope constraints on the archean and paleoproterozoic ocean redox state", Sci. 307 pp 1088 (2005).

21. Walczyk, et al, "Natural iron isotope variations in human blood", Sci. 295 pp 2065 (2002).

22. Walczyk et al, "Deciphering the iron isotope message of the human body", JMS 242 pp 117 (2005).

23. Weyer et al, "High precision Fe isotope measurements with high mass resolution MC-ICP-MS", JMS 226 pp 355 (2003).

24. Sharma et al, "Iron isotopes in hot springs along the Juan de Fuca Ridge", EPSL 194 pp 39 (2001).

25. Wilkinson et al, "Zinc isotope variation in hydrothermal systems: preliminary evidence from the Irish midlands ore field", Economic Geology 100 pp 583 (2005).

26. Pichat et al, "Zinc isotope variations in deep-sea carbonates from the eastern equatorial Pacific over the last 175 ka", EPSL 210 pp 167 (2003).

27. Stenberg et al, "Isotopic variations of Zn in biological materials", Anal. Chem. 76 pp 3971 (2004).

28. Rouxel et al, "Natural variations of Se isotopic composition determined by hydride generation multiple collector inductively coupled plasma mass spectrometry", GCA 66 pp 3191 (2002).

29. Cavazzini, "A method for determining isotopic composition of elements by thermal ionization source mass spectrometry application to strontium", JMS 240 pp 17 (2005).

30. Barling et al, "Natural mass-dependent variations in the isotopic composition of molybdenum", EPSL 193 pp 447 (2001).

31. Siebert et al, "Molybdenum isotope records as a potential new proxy for paleoceanography", EPSL 211 pp 159 (2003).

32. Arnold et al, "Molybdenum isotope evidence for widespread anoxia in mid-proterozoic oceans", Sci. 304 pp 87 (2004).

33. Schoenbachler et al, "Ag isotope variations in the earth", GCA 69 (10S) pp A387 (2005).

34. Wombacher et al, "Stable isotope compositions of cadmium in geological materials and meteorites determined by multi-collector ICPMS", GCA 67 pp 4639 (2003).

35. Schoenberg et al, "New W-isotope evidence for rapid terrestrial accretion and very early core formation", GCA 66 pp 3151 (2002).

36. Selby et al, "Direct radiometric dating of hydrocarbon deposits using rhenium-osmium isotopes", Sci. 308 pp 193 (2005).

37. Gannoun et al, "Osmium isotope heterogeneity in the constituent phases of mid-ocean ridge basalts", Sci. 303 pp 70 (2004).

38. Meibom et al, "Evidence for an ancient osmium isotopic reservoir in earth", Sci. 296 pp 516 (2002).

39. Rehkamper et al, "Thallium isotope variations in seawater and hydrogenetic, diagenetic, and hydrothermal ferromanganese deposits", EPSL 197 pp 65 (2002).

40. Nielsen et al, "Thallium isotope composition of the upper continental crust and rivers – an investigation of the continental sources of dissolved marine thallium", GCA 69 pp 2019 (2005).

41. Planchon et al, "One hundred fifty-year record of lead isotopes in Antarctic snow from Coats Land", GCA 67 pp 693 (2003).

42. Amelin et al, "Lead isotopic ages of chondrules and calcium-aluminum-rich inclusions", Sci. 297 pp 1678 (2002).

43. Andersen et al, "Towards epsilon levels of measurement precision on $^{234}U/^{238}U$ by using MC-ICPMS", JMS 237 pp 107 (2004).

44. Solov'ev et al, "Determination of U content in uranium from different sources", Sov. J. Atomic Energy 92 pp 317 (2002).

Extra-Terrestrial

1. Webster et al, "Water isotope ratios D/H, $^{18}O/^{16}O$, $^{17}O/^{16}O$ in and out of clouds map dehydration pathways", Sci. 302 pp 1742 (2003).

2. Salerno et al, "Measurement of $^{3}He/^{4}He$ in the local interstellar medium: the Collisa experiment on Mir", Astrophysical J. 585 pp 840 (2003).

3. Sephton et al, "Lithium isotope analyses of inorganic constituents from the Murchison meteorite", Astrophysical J. 612 pp 588 (2004).

4. Hams et al, "Measurement of the abundance of radioactive ^{10}Be and other light isotopes in cosmic radiation up to 2 GeV nucleon^{-1} with the balloon-borne instrument isomax", Astrophysical J. 611 pp 892 (2004).

5. Goto et al, "Carbon isotope ratio in CO/CO toward local molecular clouds with near-infrared high resolution spectroscopy of vibrational transition bands", Astrophysical J. 598 pp 1047 (2003).

6. Rubin et al, "$^{12}C/^{13}C$ ratio in planetary nubulae from the IUE archives", Astrophysical J. 605 pp 784 (2004).

7. Floss et al, "Carbon and Nitrogen isotopic anomalies in an anhydrous interplanetary dust particle", Sci. 303 pp 1355 (2004).

8. Jehin et al, "The anomalous $^{14}N/^{15}N$ ratio in comets 122P/1995 S1 (de Vico) and 153P/2002 C1 (Ikeya-Zhang)", Astrophysical J. 613 pp L161 (2004).

9. Abbas et al, "The nitrogen isotopic ratio in Jupiter's atmosphere from observations by the composite infrared spectrometer on the Cassini spacecraft", Astrophysical J. 602 pp 1063 (2004).

10. Arpigny et al, "Anomalous nitrogen isotope ratio in comets", Sci. 301 pp 1522 (2003).

11. Nguyen et al, "Discovery of ancient silicate stardust in a meteorite", Sci. 303 pp 1496 (2004).

12.Wiechert et al, "Oxygen isotopes and the moon-forming giant impact", Sci. 294 pp 345 (2001).

13. Ladd, "On the relative abundance of $C^{18}O$ and $C^{17}O$ in the Taurus molecular cloud", Astrophysical J. 610 pp 320 (2004).

14. Yong et al, "Magnesium isotope ratios in hyades stars", Astrophysical J. 603 pp 697 (2004).

15. Yong et al, "Magnesium isotopic abundance ratios in cool stars", Astrophysical J. 599 pp 1357 (2003).

16. Zhu et al, "Isotopic homogeneity of iron in the early solar nebula", Nature 412 pp 311 (2001).

17. Luck et al, "Coupled ^{63}Cu and ^{16}O excesses in chondrites", GCA 67 pp 143 (2003).
18. Podosek et al, "s-process Sr isotopic compositions in pre-solar SiC from the Murchison meteorite", Astrophysical J. 605 pp 960 (2004).

19. Hidaka et al, "Isotopic search for live ^{135}Cs in the early solar system and possibility of ^{135}Cs - ^{135}Ba chronometer", EPSL 193 pp 459 (2001).

20. Hidaka et al, "Nucleo-synthetic components of the early solar system inferred from Ba isotopic compositions in carbonaceous chondrites", EPSL 214 pp 455 (2003).

21. Boyet et al, " ^{142}Nd evidence for early (> 4.53 Ga) global differentiation of the silicate earth", Sci. 309 pp 576 (2005).

22. Sneden et al, "Europium isotopic abundances in very metal poor stars", Astrophysical J. 566 pp L25 (2002).

23. Aoki et al, "Measurement of the europium isotope ratio for the extremely metal poor, r-process-enhanced star CS 31082-001", Astrophysical J. 586 pp 506 (2003).

24. Kleine et al, "$^{182}Hf - ^{182}W$ isotope systematics of chondrites, eucrites, and martian meteorites: chronology of core formation and early mantle differentiation in Vesta and Mars", GCA 68 pp 2935 (2004).

25. Quitte et al, "Stony-iron meteorites: history of the metal phase according to tungsten isotopes", GCA 69 pp 1321 (2005).

26. Lauretta et al, "Mercury abundances and isotopic compositions in the Murchison (CM) and Allende (CV) carbonaceous chondrites", GCA 65 pp 2807 (2001).