

PREPARATION AND CHARACTERIZATION OF REFERENCE MATERIAL FOR DETERMINING THE TOTAL CONTENT AND EXCHANGEABLE FORMS OF METALLIC ELEMENTS IN SOILS

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References:

1. Council directive of 12 June 1986 on the protection of the Environment, and in particular of the soil, when sewage sludge is used in agriculture. Official Journal of the European Communities, No. L 181/6-181/12 of 4-7-1986. (1986)
2. ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
3. ISO/IEC 17043:2010 Conformity assessment General requirements for the competence of proficiency testing providers.
4. Metrological Traceability in Chemical measurement. A guide to achieving comparable results in chemical measurement. S. L. R. Ellison, A. Williams (Eds). Eurachem/CITAC Guide, 2nd ed., 2019. Available from www.eurachem.org.
5. JCGM 200:2012. International vocabulary of metrology – Basic and general concepts and associated terms (VIM). 3rd Edition. JCGM, 2012. 108 p.
6. Qingyi Liu; Jian Zhou; Min Wang; et al. Development of two new matrix certified reference materials for enrofloxacin and norfloxacin residues in fish meat powder. *Measurement*. 2023, 218, 113216.
7. Kierulf, A.; Koch, I.; Beauchemin D. Source apportionment of bioaccessible lead in soil reference materials using the continuous on-line leaching method and inductively coupled plasma mass spectrometry. *Anal. Chim. Acta*. 2022, 189, 339214.
8. Padariya, C.; Rutkowska, M.; Konieczka P. The accessibility, necessity, and significance of certified reference materials for total selenium content and its species to improve food laboratories' performance. *Food Chem*. 2023, 425, 136460.
9. Zheng Jia; Jian Zhou; Mengrui Yang; et al. Preparation and evaluation of certified reference materials for crude protein, crude fat, and crude ash in feed. *Microchem. J*. 2023, 191, 108854.
10. Zhang, M.; Pan, D.; Jin, B.; et al. Development of a certified reference material for accurate determination of the leaching of Pb and Zn in solid waste. *Anal. Bioanal. Chem*. 2023, 415, 6355–6362.
11. National Institute for Standards and Technology. Certificate, Standard Reference Material 2711a, Montana II Soil, Moderately Elevated Trace Element Concentrations. 2022, 7 p. Available from <https://tsapps.nist.gov/srmext/certificates/2711a.pdf>
12. National Institute for Standards and Technology. Certificate, Standard Reference Material 2706, New Jersey Soil, Organics and Trace Elements. 2018, 15 p. Available from <https://tsapps.nist.gov/srmext/certificates/2706.pdf>
13. European Commission, Joint Research Centre, Institute for Reference Materials and Measurements. Certificate of Analysis, Certified Reference Material BCR-143R, Sewage Sludge Amended Soil (trace elements). 2007, 3 p. Available from <https://crm.jrc.ec.europa.eu/p/40454/40470/By-application-field/Environment/BCR-143R-SEWAGE-SLUDGE-AMENDED-SOIL-trace-elements/BCR-143R>
14. ISO 11466:1995 Soil quality Extraction of trace elements soluble in aqua regia.
15. ISO Guide 35:2017 Reference materials Guidance for characterization and assessment of homogeneity and stability.
16. ISO 13528:2022 Statistical methods for use in proficiency testing by interlaboratory comparison.
17. ISO 5725-2:2019 Accuracy (trueness and precision) of measurement methods and results Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method.
18. ISO 11047:1998 Soil quality Determination of cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc Flame and electrothermal atomic absorption spectrometric methods.
19. Thompson, M. Recent trends in inter-laboratory precision at ppb and sub-ppb concentrations in relation to fitness for purpose criteria in proficiency testing. *Analyst*. 2000, 125, 385–386.
20. Horwitz, W.; Albert, R. The Horwitz ratio (HorRat): A useful index of method performance with respect to precision. *J. AOAC Int*. 2006, 89(4), 1095–1109.
21. Menshov A. I. Informativnost pokazateley magnetizma pochvennogo pokrova pri reshenii ekologicheskikh zadach. *Naukovyi visnyk Natsionalnoho hirnychoho universytetu*. 2013, 6, 92–98.