National Institute for Environmental Studies, Japan

Date

No.

National Institute for Environmental Studies

Certificate of Analysis

Certified Reference Material No. 23 Tea Leaves II

This environmental certified reference material (CRM) was developed and certified by the National Institute for Environmental Studies (NIES) for the determination of multi-elements in tea leaves and materials of similar matrix. This CRM supersedes NIES CRM No. 7 Tea Leaves.

Certified Values

Element	Mass fraction			Analytical method *
	Unit	Certified value	Uncertainty	
Calcium (Ca)	%	0.249	0.021	ICP-MS, ICP-OES, INAA, XRF
Magnesium (Mg)	%	0.169	0.012	ICP-MS, ICP-OES, INAA
Phosphorus (P)	%	0.472	0.032	ICP-MS, ICP-OES
Potassium (K)	%	2.03	0.11	AAS, ICP-MS, ICP-OES, INAA, XRF
Copper (Cu)	mg/kg	9.48	0.76	HR-ICP-MS, ICP-MS, ICP-OES, XRF
Manganese (Mn)	mg/kg	704	52	ICP-MS, ICP-OES, INAA
Nickel (Ni)	mg/kg	7.89	0.57	HR-ICP-MS, ICP-MS, ICP-OES
Strontium (Sr)	mg/kg	3.93	0.25	HR-ICP-MS, ICP-MS, ICP-OES
Zinc (Zn)	mg/kg	31.9	2.2	ICP-MS, ICP-OES, INAA

All certified values were determined based on dry mass.

The uncertainty attached to the certified values is the expanded uncertainty using a coverage factor $k = 2$, corresponding to the half-width of a confidence interval of approximately 95%.

* AAS, atomic absorption spectroscopy
HR-ICP-MS, high resolution-inductively coupled plasma-mass spectrometry
ICP-MS, inductively coupled plasma-mass spectrometry
ICP-OES, inductively coupled plasma-optical emission spectrometry
INAA, instrumental neutron activation analysis
XRF, X-ray fluorescence spectroscopy

Reference Values

Element	Mass fraction		Analytical method *
	Unit	Reference value	
Sulfur (S)	%	0.266	ICP-OES
Aluminum (Al)	mg/kg	540	ICP-OES, INAA
Barium (Ba)	mg/kg	5.43	HR-ICP-MS, ICP-MS, ICP-OES
Cesium (Cs)	mg/kg	0.0932	ICP-MS, INAA
Sodium (Na)	mg/kg	21.6	AAS, ICP-MS, ICP-OES, INAA

All reference values were determined based on dry mass.

* AAS, atomic absorption spectroscopy
HR-ICP-MS, high resolution-inductively coupled plasma-mass spectrometry
ICP-MS, inductively coupled plasma-mass spectrometry
ICP-OES, inductively coupled plasma-optical emission spectrometry
INAA, instrumental neutron activation analysis

Certified and Reference Values

The property values of the material were statistically determined based on chemical analyses by 12 organizations (including 16 laboratories) using a wide range of methods. A property value satisfying the following conditions was accepted as a certified value:

1) the relative standard deviation associated with the mean of the laboratory means was 5% or less,
2) the number of laboratories contributing to the mean of the laboratory means was at least eight, and
3) the number of methods contributing to the mean of the laboratory means was at least two.

The uncertainty attached to the certified values is the expanded uncertainty using a coverage factor $k = 2$, corresponding to the half-width of a confidence interval of approximately 95 %. A property value failing to satisfy the NIES criteria for certification but supplying valuable additional information about the material is given as a reference value. All certified and reference values were determined based on dry mass.

Description of the Material

The material consists of powdered tea leaves (35 g) sterilized by ^{60}Co irradiation (25 kGy) in an amber glass bottle.

Instructions for Use

1. This CRM should be kept tightly closed in its original bottle and stored in a desiccator at room temperature (≤30 ℃).
2. Prior to weighing aliquots for analysis, the contents of the bottle should be shaken gently.
3. For convenience of handling a minimum sample intake of 0.1 g is recommended.
4. Precautions should be taken to avoid inhalation of the material.
5. This CRM should not be used for purposes other than research. When disposing of the material, local laws concerning processing and disposal of waste materials should be strictly adhered to.
6. The mass fractions of elements in this CRM are reported on a dry mass basis. This CRM, as received, contains 2-4 % water. Correction to dry mass should be determined by drying a separate sub-sample for 4 hours at 85 ℃.

7. This CRM contains 50 % carbon, 5.1 % nitrogen, 98 mg/kg iron, and 17 mg/kg rubidium, although these values are neither certified nor reference values. An appropriate analytical method should be selected.

Expiry Date of Certification

The expiry date for the certified values of this CRM is July 2029 assuming that the recommended storage conditions are adhered to. NIES will notify via its website if any changes in the contents are recognized within the term of validity.

Collaborating Laboratories in Analysis

The certified and reference values for this CRM were based on the analytical values from the following participating organizations:

National Institute for Environmental Studies; Chuo University; Geo-Science Laboratory, Inc.; Green Blue Corporation; Japan Chemical Analysis Center; Japan Environment Sanitation Center; Murata Measuring Instrument Service Ltd.; Nagoya Institute of Technology; Nittech Research Corporation; Shimadzu Techno-Research, Inc.; Sumitomo Metal Mining Co., Ltd.; Tokyo City University

Technical Information

Technical information and the latest reports regarding this material can be obtained from the website.
http://www.nies.go.jp/labo/crm-e/index.html

July 1, 2009
Takashi Kuwana
Director
Laboratory of Intellectual Fundamentals for Environmental Studies
National Institute for Environmental Studies

Health and Environmental Risk Division,
National Institute for Environmental Studies,
16-2 Onogawa, Tsukuba, Ibaraki 305-8506 Japan
FAX: +81-29-850-2900, Email: nies.crm@nies.go.jp

Original certificate date: July 1, 2009
Certificate revision date: June 1, 2019 (Update of expiry date)
Certificate revision date: April 1, 2021 (Editorial changes)