



REFERENCE SHEET

REFERENCE MATERIAL

IAEA-375

RADIONUCLIDES AND TRACE ELEMENTS IN SOIL

Date of issue: January 2000[⊕]

Recommended Values
(Based on dry weight)

Reference Date for decay correction: 31st December 1991

Radionuclide	Recommended Value Bq/kg	95% Confidence Interval Bq/kg	N*
⁴⁰ K	424	417 – 432	84
⁹⁰ Sr	108	101 – 114	43
¹⁰⁶ Ru	56	53 – 58	26
¹²⁵ Sb	77	74 – 79	38
¹²⁹ I	0.0017	0.0013 – 0.0021	10
¹³⁴ Cs	463	454 – 472	87
¹³⁷ Cs	5280	5200 – 5360	91
²²⁶ Ra	20	18 – 22	37
²³² Th	20.5	19.2 – 21.9	11

Recommended Values
(Based on dry weight)

Element	Recommended Value mg/kg	95% Confidence Interval mg/kg	N*
Th	5.2	5.0 – 5.4	26
U	1.86	1.66 – 2.05	30

* Number of accepted laboratory means which were used to calculate the recommended values and confidence intervals.

⊕ Revision of the reference sheet dated December 1997; original report date: August 1994.

Information Values
(Based on dry weight)

Reference Date for decay correction: 31st December 1991

Radionuclide	Information Value Bq/kg	95% Confidence Interval Bq/kg	N*
²²⁸ Th	21	17 – 25	6
²³⁴ U	25	17 – 32	5
²³⁸ U	24.4	19.0 – 29.8	7
²³⁸ Pu	0.071	0.056 – 0.085	10
²³⁹⁺²⁴⁰ Pu	0.30	0.26 – 0.34	20
²⁴¹ Am	0.13	0.11 – 0.15	6

Information Values
(Based on dry weight)

Element	Information Value mg/kg	95% Confidence Interval mg/kg	N*
As	2.56	2.24 – 2.88	6
Ba	335	316 – 354	6
La	17.6	15.3 – 19.9	5
Ni	9.7	7.9 – 11.6	5
Rb	48	44 – 52	8
Yb	1.73	1.24 – 2.22	5

* Number of accepted laboratory means which were used to calculate the information values and confidence intervals.

The values listed above were established on the basis of statistically valid results submitted by laboratories which had participated in an international intercomparison exercise organized in 1992. The details concerning the criteria for qualification as a recommended value can be found in the report (IAEA/AL/075) "Report on the Intercomparison Run IAEA-375: Radionuclides in Soil" [1]. This report is available free of charge upon request.

Intended Use

This sample is intended to be used as a reference material for the measurement of radionuclides in soil samples. It can also be used as a quality control material for the assessment of a laboratory's analytical work, for the validation of analytical methods and for quality assurance within a laboratory.

Origin and preparation of the material

The material (top soil to a depth of 20 cm) was obtained from the “Staryi Viskov” collective farm in Novozybkov, Brjansk, Russia in July 1990. The material was air dried and milled to give a grain size less than 0.3 mm by the Brjansk Centre for Agricultural Radiology and Chemistry. The material was packed into 25 polythene sacks (containing approximately 20 kg of soil each) and dispatched to the Agency’s Laboratories at Seibersdorf in November 1990.

The bulk material was recombined and homogenized at the Agency’s Laboratories at Seibersdorf by mixing the powder in a 3000 L drum for 24 hours and then dispensed into plastic bottles in 250 g units. Subsequently, the samples were irradiated to a dose of 2.5×10^4 Gy using a ^{60}Co source to ensure long-term stability of the material by inhibiting microbial action.

Homogeneity

The homogeneity of the bottled material was assessed using marker analytes for trace elements (U), β -emitters (^{90}Sr) and γ -emitters (^{134}Cs and ^{137}Cs) for intake masses of 0.2 g (trace elements) and 6g (radionuclides) respectively. For this study, seven bottles were chosen at random and three determinations were made from each bottle. Taking into account the statistical uncertainties on the observed results, this material can be considered sufficiently homogeneous for its intended purposes at or above the specified intake masses.

Note: Some evidence has been presented to suggest that this material may be contaminated with “hot particles” resulting from the Chernobyl accident. The frequency of the occurrence of these “hot particles” is unknown and consequently, it is possible that significantly elevated activities may be observed for anthropogenic radionuclides in some sub-samples.

Dry weight determination

All recommended values are expressed on a dry weight basis. Therefore the dry weight must be determined at the time of analysis, using separate sub-samples of at least 500 mg dried to constant weight in a drying oven set to 105 °C. Subsequent weighings should differ by less than 5 mg.

Instructions for use

The recommended minimum intake masses for analysis of trace elements and radionuclides are 0.2 g and 6g respectively.

Analysts are reminded to take appropriate precautions in order to avoid contamination of the material during handling. No special precautions are required for the storage of this material.

Legal disclaimer

The IAEA makes no warranties, expressed or implied, with respect to the data contained in this reference sheet and shall not be liable for any damage that may result from the use of such data.

References

- [1] Strachnov V., LaRosa J., Dekner R., Zeisler R. and Fajgelj A., Report on the Intercomparison run IAEA-375: Radionuclides in Soil. IAEA/AL/075, IAEA, Vienna, Austria 1996.

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Analytical Quality Control Services (AQCS)
Agency's Laboratories, Seibersdorf
International Atomic Energy Agency
P. O. Box 100
A-1400 Vienna, Austria

Prepared by

Z. Radecki, M. Campbell, K. I. Burns