# National Institute of Standards & Technology

# Certificate of Analysis

## Standard Reference Material® 1568a

## Rice Flour

This Standard Reference Material (SRM) is intended primarily for calibrating instruments and evaluating the reliability of analytical methods for the determination of minor and trace elements in rice flour and similar agricultural food products. A unit of SRM 1568a consists of 80 g of material.

The certified values for seventeen elements are shown in Table 1. Except for sulfur, the values are based on results obtained by two or more independent analytical methods. Sulfur is certified based on its determination by a single method. Noncertified values, which are given for information only, appear in Table 2. Analytical methods used for the characterization of this SRM are given in Table 3. All values are reported as mass fractions [1], on a dry mass basis and are based on measurements using a sample mass of at least 500 mg.

**NOTICE AND WARNINGS TO USERS**

**Expiration of Certification:** The certified values for SRM 1568a are valid for five years from the date of shipment from NIST. Should any of the values change before the expiration of the certification, purchasers will be notified by NIST.

**Storage:** The material should be kept in its original bottle and stored at temperatures between 10 °C to 30 °C. It should not be exposed to intense sources of radiation, including ultraviolet lamps or sunlight. Ideally, the bottle should be kept in a desiccator, in the dark, and within the temperature range indicated.

**Use:** The bottle should be shaken well before each use. A minimum sample mass of 500 mg (dry mass - see Instructions for Drying) should be used and sample preparation procedures should be designed to effect complete dissolution for analytical determinations to be related to the certified values provided. If volatile elements (e.g. arsenic, mercury, selenium) are to be determined, precautions should be taken in the dissolution of the SRM to avoid volatilization losses.

**Instructions for Drying:** When nonvolatile elements are to be determined, samples should be vacuum dried at approximately 25 °C for 24 h at a pressure not greater than 70 Pa with a cold trap at a temperature of -30 °C or below. Volatile elements should be determined on undried samples; separate samples should be dried according to these instructions to obtain a correction factor for moisture. Moisture corrections are then made to measurement values before comparing them to the certified values. **(Note:** the moisture content at the time of bottling was approximately 8 %).

The technical and support aspects involved in the preparation, certification, and issuance of this SRM was coordinated through the Standard Reference Material Program by R. Alvarez. Revision of this certificate was coordinated through the Standard Reference Materials Program by J.C. Colbert.

*This Certificate of Analysis has undergone editorial revision to reflect program and organizational changes at NIST and at the Department of Commerce. No attempt was made to reevaluate the certificate values or any technical data presented on this certificate.*

Gaithersburg, MD 20899
August 15, 1995
(Revision of certificate dated 1-20-88)

Thomas E. Gills, Chief
Standard Reference Materials Program

Coordination of the analyses leading to the certification of this SRM was performed by M.S. Epstein of the NIST Analytical Chemistry Division.

Statistical analysis of the experimental data was performed by K.R. Eberhardt of the NIST Statistical Engineering Division.

**Preparation of Material:** The rice flour for this SRM was described by the supplier as 100 % long grain from Arkansas. At NIST, the material was passed through a 425 $\mu$m (No. 40) sieve and blended. The bottled material was then radiation sterilized at Neutron Products, Inc., Dickerson, MD.

**Homogeneity Assessment:** A preliminary evaluation of the homogeneity was made by instrumental neutron activation (INAA) using samples of approximately 500 mg. The uncertainties for the certified values in Table 1 incorporates these results.

**Certified Values and Uncertainties:** The certified mass fractions are the weighted means computed according to the procedure described in reference [2]. The uncertainty is stated as a 95 % confidence interval plus an additional allowance for systematic error among the methods used. The allowance for systematic error is the greatest difference between the weighted mean and the component means for the analytical methods used. For manganese, an additional allowance for material inhomogeneity is included, so that the uncertainty represents a 95 % expected coverage statistical tolerance interval.

Table 1. Certified Mass Fractions ($w_B$)

Minor Elements

| Element | $w_B$ (in %) |
|---|---|
| Calcium | 0.0118 ± 0.0006 |
| Magnesium | 0.056 ± 0.002 |
| Phosphorus | 0.153 ± 0.008 |
| Potassium | 0.1280 ± 0.0008 |
| Sulfur | 0.120 ± 0.002 |

Trace Elements

| Element | $w_B$ (in mg/kg) | Element | $w_B$ (in mg/kg) |
|---|---|---|---|
| Aluminum | 4.4 ± 1.0 | Mercury | 0.0058 ± 0.0005 |
| Arsenic | 0.29 ± 0.03 | Molybdenum | 1.46 ± 0.08 |
| Cadmium | 0.022 ± 0.002 | Rubidium | 6.14 ± 0.09 |
| Copper | 2.4 ± 0.3 | Selenium | 0.38 ± 0.04 |
| Iron | 7.4 ± 0.9 | Sodium | 6.6 ± 0.8 |
| Manganese | 20.0 ± 1.6 | Zinc | 19.4 ± 0.5 |

Table 2. Noncertified Mass Fractions ($w_B$)

Trace Elements

| Element | $w_B$ (in mg/kg) | Element | $w_B$ (in mg/kg) |
|---|---|---|---|
| Antimony | 0.0005 | Lead | <0.010 |
| Bromine | 8 | Tin | 0.0047 |
| Chlorine | 300 | Tungsten | 0.0012 |
| Cobalt | 0.018 | Uranium | 0.0003 |
| Iodine | 0.009 | Vanadium | 0.007 |

The values shown in this table are not certified because they are not based on the results of either two or more independent reliable methods or a definitive method of known high accuracy. These values are included for information only and therefore no uncertainty limits are provided.

Table 3. Methods used for the analyses of SRM 1568a

| Methods | Elements |
|---|---|
| DCP, INAA | Aluminum |
| Hyd-AAS, INAA | Arsenic |
| ETAAS, RNAA | Cadmium |
| FAAS, FES | Calcium |
| FAAS, INAA, RNAA | Copper |
| FAAS, IDMS, INAA | Iron |
| FAAS, FES, INAA | Magnesium |
| FAAS, INAA | Manganese |
| FIA-CV-AAS, RNAA | Mercury |
| ICP-AES, ID-ICPMS, INAA | Molybdenum |
| FES, ICP-AES, SPECTRO | Phosphorus |
| FES, INAA | Potassium |
| FES, INAA | Rubidium |
| Hyd-AAS, INAA | Selenium |
| FES, INAA | Sodium |
| IDMS | Sulfur |
| FAAS, INAA | Zinc |

Methods

| | |
|---|---|
| DCP | Direct current plasma atomic emission spectrometry |
| ETAAS | Heated graphite atomizer (electrothermal) atomic absorption spectrometry |
| FAAS | Flame atomic absorption spectrometry |
| FES | Flame emission spectrometry |
| FIA-CV-AAS | Flow injection analysis cold vapor or atomic absorption spectrometry |
| Hyd-AAS | Hydride generation atomic absorption spectrometry |
| ICP-AES | Inductively coupled plasma atomic emission spectrometry |
| IDMS | Isotope dilution mass spectrometry |
| ID-ICPMS | Isotope dilution inductively coupled plasma mass spectrometry |
| INAA | Instrumental neutron activation analysis |
| RNAA | Radiochemical neutron activation analysis |
| SPECTRO | Spectrophotometry |

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## REFERENCES

[1] Taylor, B.N., Guide for the Use of the International System of Units (SI), NIST Special Publication 811, 1995 Ed., (April 1995).
[2] Paule, R.C. and Mandel, J., NBS Journal of Research, **87**, 377-385, (1982).