National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 200a

Potassium Dihydrogen Phosphate (KH_2PO_4)

This Standard Reference Material (SRM) is a highly purified and homogeneous lot of crystalline potassium dihydrogen phosphate (KH_2PO_4). It is intended primarily for use as a working standard in the calibration and standardization of procedures employed in the fertilizer industry for the determination of potassium and phosphorus. A unit of SRM 200a consists of one bottle containing 90 g of crystalline potassium dihydrogen phosphate.

Certified Values and Uncertainties: The certified values for phosphorus and potassium, presented in Table 1, are based on assays of dried material (see "Drying Instructions") including the effects of air buoyancy, and are reported as mass fractions [1]. A NIST certified value represents data for which NIST has the highest confidence in its accuracy in that all known or suspected sources of bias have been fully investigated or accounted for by NIST. Certified values are based on results obtained by a single primary method with confirmation by other methods, or with two or more critically evaluated independent methods [2]. The certified value for phosphorus is based on the results of the coulometric acidimetric assay of SRM 200a multiplied by a gravimetric factor of 0.2276051, based on current atomic weights [3]. The value of the Faraday constant used in this work was 96485.309 C/mol [4]. The acidimetric assay represents the results of duplicate determinations from 10 randomly selected bottles from the entire lot of SRM 200a. The certified value for potassium was determined by separation of potassium and conversion to potassium sulfate. The potassium was determined gravimetrically based on atomic and molecular weights [3] of the potassium sulfate precipitate and corrections for residual potassium, contaminants, and possible transfer losses. The gravimetric value represents the result of six determinations from six randomly selected bottles from the entire lot of SRM 200a.

Table 1. Certified Values (Mass Fractions) and Uncertainties[(a)] for Phosphorus and Potassium

Phosphorus	22.7352 %	±	0.0032 %
Potassium	28.735 %	±	0.012 %

(a) The results are expressed as the certified value ± the expanded uncertainty. The expanded uncertainty in the certified value, U, is calculated as $U = ku_c$, where u_c is the combined standard uncertainty calculated according to the ISO Guide [5], and k is a coverage factor used to control the confidence level of the expanded uncertainty. A coverage factor of $k = 2$, obtained from a normal distribution using a 95 % confidence level, was used for these certified values. The acidimetric assay for phosphorus includes a Type A component for replication and Type B components for carbon dioxide interference, endpoint determination, calibration, drift, sample mass determination, buoyancy correction, atomic weights, and the Faraday constant. The gravimetric assay for potassium includes a Type A component for replication and Type B components for sample mass, ignition temperature, precipitate mass, residual potassium, contaminants and possible transfer loss.

Information Values: The information values for impurities shown in Table 2 are noncertified values with no reported uncertainties, as there is insufficient information available to assess the uncertainty associated with any value. The information values are given to provide additional characterization of the material only. These values should not be used to monitor or assess analytical performance. The information values are reported as mass fractions [1].

Expiration of Certification: The certification of **SRM 200a** is valid, within the measurement uncertainty specified, until **31 August 2014**, provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Use"). This certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Stephen A. Wise, Chief
Analytical Chemistry Division

Gaithersburg, MD 20899
Certificate Issue Date: 26 June 2009
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Robert L. Watters, Jr., Chief
Measurement Services Division

Coulometric analyses were performed by K.W. Pratt of the NIST Analytical Chemistry Division. Gravimetric analyses were performed by T.W. Vetter of the NIST Analytical Chemistry Division. Contaminants in the precipitate from the gravimetric analysis were determined by L.L. Yu using inductively coupled plasma mass spectrometry and J.R. Sieber using X-ray fluorescence spectrometry, both of the NIST Analytical Chemistry Division.

Statistical consultation was provided by W.F. Guthrie of the NIST Statistical Engineering Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

INSTRUCTIONS FOR USE

Drying Instructions: Dry for 2 hours at 110 °C before using.

Storage: The SRM should be stored, as received, in its original container with the cap tightly closed, under normal laboratory conditions.

SOURCE AND ANALYSIS[1]

Source of Material: The potassium dihydrogen phosphate was obtained from a commercial supplier. The material was examined and was found to meet or exceed the American Chemical Society specification for reagent grade potassium dihydrogen phosphate [6] in all respects. Shiva Technologies, Inc., Syracuse, NY, analyzed the material for impurities using glow discharge mass spectrometry.

Table 2. Information Values (Mass Fractions) for Selected Element

Element	(mg/kg)	Element	(mg/kg)	Element	(mg/kg)
Aluminum	1	Hafnium	<0.05	Ruthenium	<0.5
Antimony	<0.1	Holmium	<0.05	Samarium	<0.05
Arsenic	2	Indium	<0.1	Scandium	<0.01
Barium	1	Iodine	<0.1	Selenium	<0.5
Beryllium	<0.1	Iridium	<0.05	Silicon	0.9
Bismuth	<0.1	Iron	<0.1	Silver	<0.1
Boron	0.4	Lanthanum	<0.05	Sodium	36
Bromine	<0.1	Lead	<0.1	Strontium	<0.5
Cadmium	<0.1	Lithium	<0.1	Sulfur	110
Calcium	<0.5	Lutetium	<0.05	Tellurium	<0.1
Cerium	<0.05	Magnesium	<0.1	Terbium	<0.05
Cesium	<0.1	Manganese	<0.1	Thallium	<0.1
Chlorine	2	Mercury	<0.1	Thorium	<0.01
Chromium	<0.2	Molybdenum	<0.1	Thulium	<0.05
Cobalt	<0.05	Neodymium	<0.05	Tin	<0.1
Copper	<0.2	Nickel	<0.1	Titanium	<0.1
Dysprosium	<0.05	Niobium	<0.5	Tungsten	<0.5
Erbium	<0.05	Osmium	<0.05	Uranium	<0.01
Europium	<0.05	Palladium	<0.1	Vanadium	<0.05
Fluorine	<0.5	Platinum	<0.1	Ytterbium	<0.05
Gadolinium	<0.05	Praseodymium	<0.05	Yttrium	<0.1
Gallium	<0.5	Rhenium	<0.05	Zinc	<0.5
Germanium	<0.1	Rhodium	<0.1	Zirconium	<0.05
Gold	<0.5	Rubidium	4		

[1]Certain commercial equipment, instruments, or materials are identified in this certificate in order to specify adequately the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

REFERENCES

[1] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297; U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/.

[2] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements;* NIST Special Publication 260–136, U.S. Government Printing Office: Washington, DC (2000); available at http://ts.nist.gov/MeasurementServices/ReferencesMaterials/SP260-136.PDF.

[3] IUPAC Commission on Atomic Weights and Isotopic Abundances, Pure Appl. Chem. Vol. 71(8), pp. 1593–1607, (1999).

[4] Cohen, E.R.; Taylor, B.N.; J. Res. Nat. Bur. Stand. Vol**.** 92(2**)**, pp. 85–95, (1987).

[5] ISO; *Guide to the Expression of Uncertainty in Measurement*; ISBN 92-67-10188-9, 1st ed., International Organization for Standardization: Geneva, Switzerland (1993); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/.

[6] ACS; *Reagent Chemicals*, 9th ed., American Chemical Society, Washington, DC (1999).

Certificate Revision History: 26 June 2009 (Update of expiration date and editorial changes); 22 May 2001 (Original certificate).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-2200; fax (301) 926-4751; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.