Physical Property Standards

Fluka Analytical

Standards and CRMs for:

- Viscosity
- Melting Point
- Density
- Conductivity
- Turbidity
- Particle Size
- Color

There's probably no laboratory in chemical research, analytics or quality control that can do without measuring physical properties. These complement the data of chemical properties for the determination of the identity and purity of substances and materials.

When a chemist is characterizing a substance that has been synthesized, the **melting point** is surely one very important specification. For the production process of bio diesel, monitoring of the **viscosity** is absolutely crucial. **Conductivity** measurements are an important tool in the quality control of water. The **particle size** distribution of starch is an important characteristic, which has influence in its gelatinization and pasting properties, its baking characteristics, cristallinity and swelling properties.

These are just a few simple examples to illustrate the huge variety of applications where measurements of physical properties are relevant.

The application fields range from pharmaceutical industry through environmental analysis, food and beverage analysis, forensics to material sciences.

To ensure the accuracy of these measurements, the equipment needs to be regularly calibrated using accurate analytical standards with known properties.

Sigma-Aldrich® offers a wide range of physical property standards for various applications in the chemical, food and material science industries. These include standards for density, melting point, conductivity, viscosity, particle size, turbidimetry as well as color reference standards.

Taking into account the growing need for certified reference materials that are traceable to internationally accepted reference materials such as NIST or BAM, we offer physical property standards from recognized suppliers of high quality Certified Reference Materials (CRMs) such as IRMM, Whitehouse scientific, H&D Fitzgerald or Paragon Scientific.

This brochure gives an overview of the physical property standards in the Sigma-Aldrich portfolio. We are continuously expanding and complementing our product portfolio, please consult the web for up to date information about our portfolio: ***www.sigma-aldrich.com/standards***

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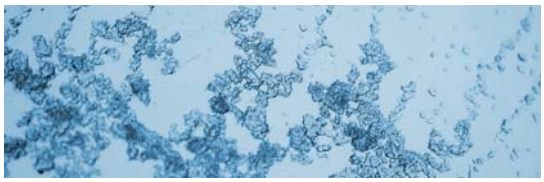
Melting Point Standards



Melting point is used to identify compounds and estimate purity. We offer a range of melting point standards to help ensure reliable performance of melting point instruments. Replicate measurements allow reporting of an uncertainty value, +/- 0.3°C to +/- 0.5°C. Measurements are made in the thermodynamic mode, with traceability to primary reference material.

Table 1 Fluka-brand Melting Point Standards

Cat. No.	Brand	Description	Package Size
76170	Fluka	Melting Point standard 121 – 123°C (Benzoic acid)	5 g
42183	Fluka	Melting Point standard 182 – 184°C (p-Anisic acid)	250 mg, 1g
41019	Fluka	Melting Point standard 235 – 237°C (Caffeine)	1 g, 5g
67372	Fluka	Melting Point standard 283 – 286°C (Anthraquinone)	250 mg, 1g
50296	Fluka	Melting Point standard 47 – 49°C (Benzophenone)	1g, 5g
01422	Fluka	Melting Point standard 79 – 81°C (Naphthalene)	250 mg, 1g

Certified Density Standards from H&D Fitzgerald

Table 2 H&D Fitzgerald Density Standards

Cat. No.	Brand	Description*	Package Size
15889	Fluka	Density Standard, 692 kg/m^3	10 mL
76081	Fluka	Density Standard, 749 kg/m^3	10 mL
76731	Fluka	Density Standard, 870 kg/m^3	10 mL
44964	Fluka	Density Standard, 998 kg/m^3	10 mL
89353	Fluka	Density Standard, 1191 kg/m^3	10 mL
36232	Fluka	Density Standard, 1251 kg/m^3	10 mL
12156	Fluka	Density Standard, 1623 kg/m^3	10 mL

** The precise density (at a given temperature) uncertainty is provided with each sample. Density standards have an uncertainty of ±0.01 to ±0.03 kgm-3 over the stated temperature range.*

Density standards are used to calibrate density meters. Although calibration with air and water is common practice, using reference standards has benefits with regard to GLP compliance and traceability of the calibration to recognised national standards. We offer a line of liquid density standards from respected density metrologists H&D Fitzgerald. ISO 9001 and 17025 compliant, the standards are also supplied with a UKAS-accredited calibration certificate, linking them to recognized national standards of mass, temperature and pressure. They are produced using a UKAS-accredited hydrostatic weighing system, and supplied in 10 mL sealed ampuls with a certificate of analysis.

Conductivity Standards

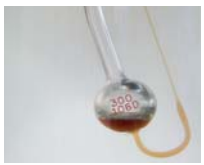
Table 3 Conductivity Standards

Cat. No.	Brand	Description	Package Size
11118	Fluka	Conductivity Standard Solution, 50 mS/m	500 mL
60134	Fluka	Standard Solution A, acc. to ISO 7888 (1290 mS/m)	250 mL
60136	Fluka	Standard Solution B, acc. to ISO 7888 (141 mS/m)	250 mL
60138	Fluka	Standard Solution C, acc. to ISO 7888 (14.7 mS/m)	250 mL

The electrical conductivity of aqueous solutions is a measure of the current conducted by the ions present in the water. The factors, that determine the conductivity are concentration and nature of the ions as well as temperature and viscosity of the solution. The electrical conductivity of pure water is 5.483 µS/m at 25°C due to its own dissociation. The regulation ISO 7888 describes the use of electrical conductivity for monitoring the quality of surface water, process water and waste water. We offer three potassium chloride standard solutions according to ISO 7888. The KCl concentrations of these solutions are 0.1M (solution A), 0.01M (solution B) and 0.001M (solution C) and the corresponding conductivities are 1290 mS/m, 141 mS/m and 14.7 mS/m. In addition, we offer a standard solution with a conductivity of 50 mS/m (c(KCl) 0.0035 M)

Viscosity Standards from Paragon Scientific

Accurate viscosity measurements play an important role in various fields of industry, such as food & beverage, paint & coatings, pharmaceutical and petroleum. For the calibration and verification of viscosity measuring equipment, analytical standards with known viscosities are needed.



Sigma-Aldrich offers viscosity standards from Paragon Scientific, that have been recently added to the Fluka portfolio. These standards are produced in the United Kingdom in an ISO 17025 certified laboratory. They are manufactured in strict accordance with ASTM D 2162 (Standard Practice for basic calibration of master viscosity standard oils) and are traceable to NIST. In the certificate, the viscosity values and the density are stated at various temperatures as well as expiry date and uncertainties. The viscosity values are given as kinematic viscosity (mm^2/s (cSt)) and as dynamic viscosity (mPa's (cP)) for all the temperatures.

Table 4 Certified Viscosity and Density Standards from Paragon

Cat. No.	Brand	Description	Kinematic Viscosity (mm^2/s (cSt)) at 25°C	Dynamic Viscosity (mPa's (cP)) at 25°C	Package Size
01446	Fluka	Viscosity and Density Standard N0.4	0.4583	0.3006	500 ML
67348	Fluka	Viscosity and Density Standard N0.8	0.6205	0.4329	500 ML
19044	Fluka	Viscosity and Density Standard N0.1	1.189	0.9184	500 ML
93835	Fluka	Viscosity and Density Standard N2	2.216	1.770	500 ML
41859	Fluka	Viscosity and Density Standard S3	4.014	3.251	500 ML
49571	Fluka	Viscosity and Density Standard D5	6.086	4.975	500 ML
05867	Fluka	Viscosity and Density Standard S6	8.792	7.237	500 ML
05854	Fluka	Viscosity and Density Standard D10	12.42	10.31	500 ML
63484	Fluka	Viscosity and Density Standard N10	17.01	14.43	500 ML
05428	Fluka	Viscosity and Density Standard S20	34.11	28.98	500 ML
18964	Fluka	Viscosity and Density Standard N35	65.07	55.43	500 ML
05397	Fluka	Viscosity and Density Standard S60	118.7	102.0	500 ML
05395	Fluka	Viscosity and Density Standard N100	238.3	206.0	500 ML
01437	Fluka	Viscosity and Density Standard S200	456.2	396.2	500 ML
69443	Fluka	Viscosity and Density Standard D500	578.1	502.5	500 ML
04870	Fluka	Viscosity and Density Standard N350	851.2	740.3	500 ML
08670	Fluka	Viscosity and Density Standard D1000	1159	1010	500 ML
08577	Fluka	Viscosity and Density Standard S600	1460	1277	500 ML
19495	Fluka	Viscosity and Density Standard N1000	2981	2618	500 ML
38177	Fluka	Viscosity and Density Standard S2000	5267	4638	500 ML
73284	Fluka	Viscosity and Density Standard D5000	5644	4975	500 ML
11492	Fluka	Viscosity and Density Standard D7500	8702	7686	500 ML
09216	Fluka	Viscosity and Density Standard N4000	11627	10296	500 ML
50989	Fluka	Viscosity and Density Standard S8000	22553	20032	500 ML
13219	Fluka	Viscosity and Density Standard N15000	44855	40006	500 ML
41272	Fluka	Viscosity and Density Standard S30000	79747	71382	500 ML

Turbidity Standards

The measurement of turbidity is an important method in water quality testing. Turbidity can be defined as a decrease in the transparency of a solution due to the presence of suspended and dissolved substances, which causes incident light to be scattered, reflected, and attenuated rather than transmitted in straight lines; the higher the intensity of the scattered or attenuated light, the higher the value of turbidity. Simply stated, turbidity is the measure of relative sample clarity. Turbidity can be expressed in nephelometric turbidity units (NTU).

The AQUANAL®-plus Spectro Turbidity (cat. No 70034) is designed as a compact, easy to use instrument to determine turbidity fast and accurately in the range 0.1 – 2000 NTU. A light emitting diode (LED) is used as the light source with a photo detector positioned to detect light scattered by a sample at 90°C to the incident beam.

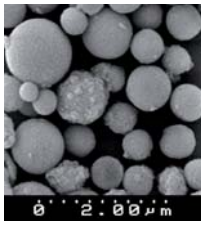
The four secondary calibration standards delivered with the device can be ordered in sets of 2 or 4 standards and can also be used for any other turbidity measurement device.

The standards are delivered in quantities of 15 ml in vials made out of optical glass. These vials are suitable for measurements directly in the AQUANAL-plus Spectro Turbidity instrument. Therefore the standards can be used as they are without any decanting or dilution. They can also be used for any other turbidity measurement instrument, although decanting into a suitable cuvette might be necessary depending on the instrument type.

Table 5 Turbidity Measurement Equipment and Standards

Cat. No.	Brand	Description
70034	Fluka	AQUANAL-plus Spectro Turbidity
70036	Fluka	Secondary turbidity standards: 1 and 10 NTU, 2 pcs
70037	Fluka	Secondary turbidity standards: 100 and 1000 NTU, 2 pcs
70110	Fluka	Secondary turbidity standards: 1, 10, 100 and 1000 NTU, 4 pcs

Certified Standards from Whitehouse Scientific



Polydisperse Particle Size Standards

These NIST (National Institute of Standards and Technology (USA)) and NPL (National Physical Laboratory (UK)) traceable standards were commissioned by the Bureau of Certified References (BCR) and are measured by a large international team including the 20 top laboratories in the field of particle size. For the certification of the glass particles, several unambiguous primary methods such as microscopy, sieving, sedimentation and Coulter counter were used. The standards are delivered in Sets of 10 vials in quantities suitable for any method of analysis without further subdivision.

Table 6 Polydisperse Particle Size Standards from Whitehouse Scientific

Cat. No.	Brand	Description	Package Size
51358	Fluka	Polydisperse Particle Standard 0.1 – 1µm	10 x 0.02 g
42459	Fluka	Polydisperse Particle Standard 1– 10µm	10 x 0.1 g
05724	Fluka	Polydisperse Particle Standard 3 – 30 µm	10 x 0.05 g
94078	Fluka	Polydisperse Particle Standard 3 – 30 µm	10 x 0.1 g
80847	Fluka	Polydisperse Particle Standard 10 – 100 µm	10 x 0.25 g
40579	Fluka	Polydisperse Particle Standard 10 – 100 µm	10 x 0.5 g
08718	Fluka	Polydisperse Particle Standard 10 – 100 µm	10 x 1 g
57563	Fluka	Polydisperse Particle Standard 50 – 350 µm	10 x 0.5g
78456	Fluka	Polydisperse Particle Standard 50 – 350 µm	10 x 2.5g
94773	Fluka	Polydisperse Particle Standard 150 – 650 µm	10 x 2.5 g

Sieve Calibration Standards

The Sieve Calibration Standards from Whitehouse Scientific offer a unique method of calibrating sieves with traceability to NIST and NPL. The glass microspheres are delivered in sets of single shot bottles in order to eliminate operator-sampling errors.

The calibration requires only about 2 minutes following a simple procedure: The glass microspheres are placed into the sieve which is shaken either manually or mechanically, until an equilibrium has reached and no more particles pass the sieve.

By weighing the sieve and the single shot bottle before and after the calibration, the percentage of microspheres passing the sieve can be calculated and the mean aperture size of the sieve can thus be determined using the calibration graph supplied with the test certificate.

Table 7 Sieve Calibration Standards from Whitehouse Scientific

Cat. No.	Brand	Description	Mesh #	Calibration Range	Package Size
12655	Fluka	Sieve Standard 45 µm	325	42.0 – 50.8	5 x 1.0 g
49500	Fluka	Sieve Standard 63 µm	230	56.6 – 70.4	5 x 1.0 g
42696	Fluka	Sieve Standard 75 µm	200	67.1 – 82.8	5 x 1.0 g
61847	Fluka	Sieve Standard 106 µm	140	91.4 – 117	5 x 1.0 g
18867	Fluka	Sieve Standard 125 µm	120	112 – 139	5 x 1.0 g
75446	Fluka	Sieve Standard 150 µm	100	134 – 167	5 x 1.5 g
43390	Fluka	Sieve Standard 180 µm	80	161 – 199	5 x 1.5 g
41544	Fluka	Sieve Standard 250 µm	60	226 – 281	5 x 2.5 g
67246	Fluka	Sieve Standard 300 µm	50	270 – 333	5 x 2.5 g
78900	Fluka	Sieve Standard 500 µm	35	440 – 557	5 x 2.5 g

Color Reference Standards

As one of the most obvious characteristic of a material, the appearance, especially the color, plays an important role as a specification criteria in quality control. To ensure reproducibility and comparability of this important property, Sigma-Aldrich offers a series of color reference solutions for liquids and for solids the new Sigma-Aldrich color chart.

Color Reference Solutions

Color reference solutions are used to measure the degree of coloration of liquids in the red, yellow, green, blue and brown color ranges as specified by the European Pharmacopoeia (Ph. Eur.), United States Pharmacopoeia (USP) and by federal institutes such as the American Society for Testing and Materials (ASTM).

Sigma-Aldrich offers the most commonly used color reference solutions according to Ph. Eur., USP and ASTM/APHA. These solutions are used to estimate the color of a liquid against established international and standardised liquid color values. The two convenient package sizes, 2 mL or 10 mL, are sealed in airtight ampules under argon. Each set is supplied with a certificate of analysis with the expiration date clearly indicated on the label.

Proper Use of Color Standards

The perception of color and similarities between colors depends to a great extent on the viewing conditions and quality of illumination. Determinations should be made under diffuse, uniform illumination and conditions that minimise shadows and non-spectral reflectance. Liquids should be compared in matched color comparison tubes against a white background. The colors of the standards should be as close as possible to those of the samples when quantifying color differences.

Color Reference Solutions acc. to Ph. Eur.

Ph. Eur. solutions are available as a complete set of 37 solutions, divided into five color series: red (R1-R7), greenish-yellow (GY1-GY7), yellow (Y1-Y7), brownishyellow (BY1-BY7) and brown (B1-B9). Each color series is also sold separately.

Table 8 Color Reference Solutions acc. to Ph. Eur.

Cat. No.	Brand	Description	Package Size
83952	Fluka	Color reference solutions B, BY, Y, GY, R acc. to Ph. Eur., set	Set of 2 mL ampuls
83951	Fluka	Color reference solutions B acc. to Ph. Eur., set	Set of 2 mL ampuls
86293	Fluka	Color reference solutions BY acc. to Ph. Eur., set	Set of 2 mL ampuls
83883	Fluka	Color reference solutions Y acc. to Ph. Eur., set	Set of 2 mL ampuls
82995	Fluka	Color reference solutions GY acc. to Ph. Eur., set	Set of 2 mL ampuls
87448	Fluka	Color reference solutions R acc. to Ph. Eur., set	Set of 2 mL ampuls
90232	Fluka	Color reference solutions B, BY, Y, GY, R acc. to Ph. Eur., set	Set of 10 mL ampuls
92936	Fluka	Color reference solutions B acc. to Ph. Eur., set	Set of 10 mL ampuls
72666	Fluka	Color reference solutions BY acc. to Ph. Eur., set	Set of 10 mL ampuls
83967	Fluka	Color reference solutions Y acc. to Ph. Eur., set	Set of 10 mL ampuls
90269	Fluka	Color reference solutions GY acc. to Ph. Eur., set	Set of 10 mL ampuls
95872	Fluka	Color reference solutions R acc. to Ph. Eur., set	Set of 10 mL ampuls

Color Reference Solutions acc. to USP

The USP prescribes twenty different color solutions, marked A-T, covering the range red, yellow, green, blue and purple. These solutions are available in one complete set.

Table 9 Color Reference Solutions acc. to USP

Cat. No.	Brand	Description	Package Size
87576	Fluka	Color reference solutions acc. to USP, set	Set of 2 mL ampuls
87574	Fluka	Color reference solutions acc. to USP, set	Set of 10 mL ampuls

Color Reference Solutions acc. to ASTM/APHA

ASTM lists a standard method for the visual measurement of the color of light-colored liquids using the platinum-cobalt scale. This method is referred to by many as APHA color. The preparation of these platinum-cobalt standards was originally described by A. Hazen. Consequently, this test is also termed "Hazen Color." The complete APHA set comprises 20 standard solutions, marked with different color standard numbers: 5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70, 100, 150, 200, 250, 300, 350, 400, 450 and 500.

Table 10 Color Reference Solutions acc. to ASTM/APHA

Cat. No.	Brand	Description	Package Size
72599	Fluka	Color reference solutions acc. to APHA, set	Set of 2 mL ampuls
77147	Fluka	Color reference solutions acc. to APHA, set	Set of 10 mL ampuls

The Sigma-Aldrich Color Chart for Solids

With the Sigma-Aldrich Color Chart we now give our customers a fast and uncomplicated tool to **check and compare the color of solids.**

The Sigma-Aldrich Color Chart has been developed for internal use in quality control of all the Sigma-Aldrich production sites.

Table 11 Color Chart for Solids

Cat. No.	Brand	Description
91711	Fluka	Sigma-Aldrich Color Chart

Considering our huge portfolio of different chemical products, the common color system should bring clarity in the jungle of colors and be simple to apply in the daily practice. Furthermore it should be based upon an accepted color system; communicable, reproducible and applicable everywhere.

Many color order systems use a quasi-spherical color space, in which the position of each color is described with three coordinates. We chose the Munsell color order system, which fulfilled all our needs. Therein each color is identified by the attributes of hue, value and chroma.

The Munsell Books of Color contains thousands of color chips which are defined according to the Munsell color system. This large number of colors is much too big to handle in daily practice during practical tests we identified the colors most frequently occurring in our products, which colors most often caused problems in the color communication and with which colors we most frequently had to use paraphrases to explain the color.

The result is a selection of colors from the Munsell color order system; this selection contains 51 color chips. These chips are applied to a white background on one page. No turning of pages is necessary, which facilitates and speeds up the daily use of the color chart. Below the color chips you find the short-code plus the internally defined color name. On the other page there is a table from which you can see the hue, value and chroma for each of the colors according to the Munsell system.

Certified Physical Property Standards from the IRMM

The IRMM (Institute of Reference Materials and Measurements), founded in 1957 and situated in Geel (Belgium), is one of the seven institutes of the Joint Research Center, a Directorate-General of the European commission. The mission of IRMM is to promote a common and reliable European measurement system in support of EU policies.

As a part of this, the IRMM supplies certified reference materials (pure and matrix materials) for various applications including environmental analysis, food analysis, clinical chemistry, physical properties or industrial applications.

As an official distributor, Sigma-Aldrich offers all the IRMM certified reference materials including about 80 CRMs for physical properties.

A complete listing of physical property standards from the IRMM can be found on our website at:
www.sigmaaldrich.com/physicalproperties_irmm

On the page ***www.sigmaaldrich.com/irmm*** you will find a link to the complete IRMM catalogue as well as a link to the IRMM online catalogue where certificates and reports to all the products are directly accessible.

In the following tables, we give an overview on the products and product classes of reference materials for thermal, mechanical, morphological and optical properties as well as for certified reference materials for isotopic measurements .

Certified Materials for Thermal Properties

Thermal conductivity (λ) is the ability of a material to conduct heat. It is one of the fundamental material characteristics governing heat transport in industrial processes.

Table 12 Certified Materials for Thermal Properties

Cat. No.	Description	Certified for
IRMM440A IRMM440B IRMM440C IRMM440D	Resin bonded glass fiber board	Thermal Conductivity
BCR724A BCR724B BCR724C BCR724D BCR724E	Glass Ceramic	Thermal Conductivity
BCR-039	Pyrex Glass	Thermal Conductivity

Certified Materials for Mechanical Properties

The European Federation of Chemical Engineering (EFCE) developed a test method to determine the shear strength of powders under different compaction and loading conditions. Product BCR-116 is a limestone powder certified in accordance with this test.

Creep is the progressive deformation of a material under load. The certified material BCR-425 has been developed for the validation of creep testing rigs and procedures.

BCR-692 is intended to use for the verification of the overall performance of scratch test instruments.

Table 13 Certified Materials for Mechanical Properties

Cat. No.	Description	Certified for
BCR-116	Limestone Powder	Shear testing
BCR-425	Nickel-based alloy	Creep testing
BCR-692	Diamond-like-carbon coated steel	Scratch testing

The Charpy pendulum impact test is designed to assess the resistance of a material to shock loading, by breaking a notched bar using a hammer rotating around a fixed horizontal axis. Because the energy absorbed by the test sample depends very much on the construction of the pendulum, reference test pieces are required. The certified test bars from ERM are delivered in packages with 5 pieces.

Table 14 Reference materials for mechanical properties (Charpy specimen)

Cat. No.	Description	Certified for
ERM-FA013	Charpy specimen	Impact toughness (30 J)
ERM-FA014	Charpy specimen	Impact toughness (60 J)
ERM-FA015	Charpy specimen	Impact toughness (80 J)
ERM-FA016	Charpy specimen	Impact toughness (120 J)
ERM-FA415	Charpy specimen	Impact toughness (150 J)

Certified Materials for Morphological Properties

The IRMM supplies several particle size standards certified for Stokes diameter or volume diameter respectively, as well as certified reference material for specific surface area. The corresponding product numbers are listed in the table below.

Table 15 Certified Materials for Morphological Properties

Cat. No.	Description	Certified for
BCR-066	Quartz 0.35-3.50 µm	Stokes' diameter
BCR-067	Quartz 2.40-32.00 µm	Stokes' diameter
BCR-069	Quartz 14-90 µm	Stokes' diameter
BCR-070	Quartz 1.20-20.00µm	Stokes' diameter
BCR-068	Quartz 160-630 µm	Volume diameter
BCR-130	Quartz 50-220 µm	Volume diameter
BCR-131	Quartz 480-1800 µm	Volume diameter
BCR-132	Quartz 1400-5000 µm	Volume diameter
BCR-169	Alpha Alumina	Specific Surface area
BCR-170	Alpha Alumina	Specific Surface area
BCR-171	Alumina	Specific Surface area
BCR-172	Quartz	Specific Surface area
BCR-173	Tutanium Dioxide	Specific Surface area
BCR-175	Tungsten	Specific Surface area

For measurements of compositional depth profiles using ion beam sputtering in association with Auger Electron Spectroscopy, a reference material of known thickness is required. BCR-261T is a tantalum pentoxide on tantalum foil reference materials with two nominal thicknesses (30 nm and 100 nm) available as four rectangular foils for each oxide thickness.

BCR-301, certified for lattice spacing is intended for the use as standard in X-ray diffraction analysis.

The microcrystalline cellulose reference material BCR-302 has been developed to check the implementation of the water sorption method recommended by the COST 90, a procedure for the determination of water sorptions isotherms in foods. The material is certified for its water content when in equilibrium with the atmosphere above 10 specified salt solution at 25°C.

The recently added IRMM-304 is not a CRM but an example of a QCM (quality control material) for morphological properties. It consists of silica nanoparticles, suspended in an aqueous solution and its intended use is to check the performance of instruments or methods that characterize the particle size distribution of nanoparticles suspended in a liquid medium.

Since silicon oxide/silicon interface characteristics gain more and more importance, reference materials of silicon dioxide layers of defined thicknesses on silicon wafers are needed. With the certified reference material BCR-564 we offer such a reference material intended to be used as calibration standards for ellipsometry (Set of three standards, 1 standard each for 10, 50 and 120 nm SiO2 on silicon wafer). Products BCR-704 and BCR-705 are certified for micropore volume and median micropore width. Their intended use is to test the accuracy and the effectiveness of instruments for pore size analysis based on gas adsorption.

Table 16 Certified Materials for Morphological Properties

Cat. No.	Description	Certified for
BCR-261T	Tantalum Pentoxide	Depth profiling by ion beam sputtering
BCR-301	Mullite	Lattice spacing
BCR-302	Microcrystalline Cellulose	Water Sorption
IRMM-304	Colloidal Silica (suspension)	Particle Size Distribution
BCR-564	Silicon	Thickness of Silicon Dioxide
BCR-704	Faujasite type zeolite	Micropore volume / median micropore width
BCR-705	Linde type A zeolite	Micropore volume / median micropore width

Certified Materials for Optical Properties

Certified reference material BCR-400 consists of a ceramic tile with a color typical of that required by the tomato processing industry. The material is intended to be used for calibration of a tristimilus colorimeter.

BCR-406A is a reference material for colorimeters and spectrophotometers measuring color in reflection.

Table 17 Reference Materials for Optical Properties

Cat. No.	Description	Certified for
BCR-400	Tomato paste color tile	Hunter L, a, b Values
BCR-406A	Opal glass	Spectral Reflectance

Certified Reference Materials for Isotopic Measurements

There are two types of materials related to isotopic measurements: Materials that are certified for the isotope abundance ratio and materials, that are certified for the isotope amount content. The former are suitable for calibration of measurements of isotope abundance ratios. The latter can be directly used in isotope dilution as "spikes" against which an unknown amount of an isotope or an element can be measured.

Table 18 Reference materials for Isotopic Measurements

Cat. No.	Description	Certified for
IRMM-011	H_3BO_3	Isotope abundance ratio
ERM-AE701	^{41}Ca in 0.6M HNO_3	Isotope abundance ratio
IRMM-012	^{52}Cr in 1M HCl	Isotope abundance ratio
IRMM-014a	Fe nat cubes	Isotope abundance ratio
IRMM-014b	Fe nat wire	Isotope abundance ratio
IRMM-015	^{6}Li (Li_2CO_3)	Isotope abundance ratio
IRMM-016	^{7}Li (Li_2CO_3)	Isotope abundance ratio
IRMM-009	^{24}Mg in 0.2M HNO_3	Isotope abundance ratio
IRMM-010	Pt isotopic wire	Isotope abundance ratio
IRMM-017	Si single crystal	Isotope abundance ratio
IRMM-018a	^{28}Si (SiO_2)	Isotope amount content
IRMM-610	^{10}B aqueous solution	Isotope amount content
IRMM-611	^{11}B aqueous solution	Isotope amount content
IRMM-621	^{111}Cd in 1M HNO_3	Isotope amount content
IRMM-622	^{111}Cd in 1M HNO_3	Isotope amount content
ERM-AE641	^{35}Cl in water	Isotope amount content
ERM-AE642	^{37}Cl in water	Isotope amount content
IRMM-624	^{50}Cr in 1M HCl	Isotope amount content
IRMM-625	^{51}Cr in 1M HCl	Isotope amount content
IRMM-632	^{65}Cu in 1M HNO_3	Isotope amount content
ERM-AE633	^{63}Cu in 1M HNO_3	Isotope amount content
ERM-AE647	^{63}Cu in 1M HNO_3	Isotope amount content
IRMM-620	^{57}Fe in 4.5M HCl	Isotope amount content
IRMM-634	^{56}Fe in 1.8M HCl	Isotope amount content
ERM-AE639	^{202}Hg in 0.5M HCl	Isotope amount content
ERM-AE640	^{202}Hg in 0.5M HCl	Isotope amount content
IRMM-615	^{6}Li in 0.5M HCl	Isotope amount content
ERM-AE637	^{24}Mg in 0.2M HNO_3	Isotope amount content
ERM-AE638	^{26}Mg in 0.1M HNO_3	Isotope amount content
IRMM-618	^{87}Rb in 0.5M HNO_3	Isotope amount content
IRMM-619	^{85}Rb in 0.5M HNO_3	Isotope amount content
IRMM-643	^{32}S in 2.8M HNO_3	Isotope amount content
IRMM-644	^{32}S in 3.2M HNO_3	Isotope amount content
IRMM-645	^{32}S in 2.8M HNO_3	Isotope amount content
IRMM-646	^{34}S in 2.8M HNO_3	Isotope amount content
IRMM-635	^{84}Sr in 1M HNO_3	Isotope amount content
ERM-AE649	^{205}Tl in 1M HNO_3	Isotope amount content
IRMM-007	^{64}Zn in 0.5M HNO_3	Isotope amount content
IRMM-651	^{64}Zn in 0.5M HNO_3	Isotope amount content
IRMM-652	^{64}Zn in 0.5M HNO_3	Isotope amount content
IRMM-653	^{67}Zn in 0.5M HNO_3	Isotope amount content
IRMM-654	^{68}Zn in 0.5M HNO_3	Isotope amount content
IRMM-3702	^{64}Zn in 1M HNO_3	Isotope amount content

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