

ULTRAgold™ Custom Standard

Product Number ICUS-3684

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Lot Number: AU-01129

Lot Issue Date: 28-Mar-2017

Expiration Date: 30-Apr-2018

This Certified Reference Material (CRM) is intended for use as a calibration standard for the quantitative determination of the analytes listed. The CRM was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system. The certified concentration value reported for each analyte is based upon the gravimetric and volumetric measurements made during the preparation of the CRM. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory using an appropriate analytical technique.

Analyte	Certified Value	Verification	NIST SRM
barium nitrate (ICP grade) (as barium)	10.0 ± 0.3 µg/mL	ICP/ICP-MS	3104a
beryllium acetate (ICP grade) (as beryllium)	10.0 ± 0.3 µg/mL	ICP/ICP-MS	3105a
manganese (II) nitrate (ICP grade) (as manganese)	10.0 ± 0.2 µg/mL	ICP/ICP-MS	3132
silver nitrate (ICP grade) (as silver)	20.0 ± 0.2 µg/mL	ICP/ICP-MS	3151
cadmium nitrate hydrate (ICP grade) (as cadmium)	20.0 ± 0.7 µg/mL	ICP/ICP-MS	3108
copper (II) nitrate hydrate (ICP grade) (as copper)	20.0 ± 1.1 µg/mL	ICP/ICP-MS	3114
cobalt nitrate hexahydrate (ICP grade) (as cobalt)	7.01 ± 0.22 µg/mL	ICP/ICP-MS	3113
chromium (III) nitrate nonahydrate (ICP grade) (as chromium)	20.0 ± 0.5 µg/mL	ICP/ICP-MS	3112a
zinc nitrate hexahydrate (ICP grade) (as zinc)	20.0 ± 0.2 µg/mL	ICP/ICP-MS	3168a
ammonium metavanadate (ICP grade) (as vanadium)	50.1 ± 1.8 µg/mL	ICP/ICP-MS	3165
arsenic (III) oxide (ICP grade) (as arsenic)	80.1 ± 5.8 µg/mL	ICP/ICP-MS	3103a
lithium carbonate (ICP grade) (as lithium)	50.1 ± 1.8 µg/mL	ICP/ICP-MS	3129a
nickel (II) nitrate hexahydrate (ICP grade) (as nickel)	50.1 ± 1.7 µg/mL	ICP/ICP-MS	3136
aluminum nitrate nonahydrate (ICP grade) (as aluminum)	100.1 ± 3.2 µg/mL	ICP/ICP-MS	3101a
boric acid (ICP grade) (as boron)	100.4 ± 0.7 µg/mL	ICP/ICP-MS	3107

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Analyte	Certified Value	Verification	NIST SRM
iron (III) nitrate, ferric nitrate (ICP grade) (as iron)	100.1 ± 3.1 µg/mL	ICP/ICP-MS	3126a
lead (II) nitrate (ICP grade) (as lead)	100.2 ± 2.3 µg/mL	ICP/ICP-MS	3128
selenium (IV) oxide (ICP grade) (as selenium)	100.2 ± 2.7 µg/mL	ICP/ICP-MS	3149
strontium nitrate (ICP grade) (as strontium)	100.2 ± 6.0 µg/mL	ICP/ICP-MS	3153a
indium (ICP grade)	500.0 ± 11 µg/mL	ICP/ICP-MS	3124a
calcium carbonate (ICP grade) (as calcium)	1000 ± 7 µg/mL	ICP/ICP-MS	3109a
sodium nitrate (ICP grade) (as sodium)	1001 ± 7 µg/mL	ICP/ICP-MS	3152a
potassium nitrate (ICP grade) (as potassium)	1002 ± 7 µg/mL	ICP/ICP-MS	3141a
magnesium nitrate hexahydrate (ICP grade) (as magnesium)	1001 ± 6 µg/mL	ICP/ICP-MS	3131a
thallium (I) nitrate (ICP grade) (as thallium)	1001 ± 17 µg/mL	ICP/ICP-MS	3158
molybdenum (VI) oxide (ICP grade) (as molybdenum)	50.1 ± 1.2 µg/mL	ICP/ICP-MS	3134
antimony (ICP grade)	100.0 ± 3.0 µg/mL	ICP/ICP-MS	3102a
ammonium hexafluorotitanate (IV) (ICP grade) (as titanium)	50.0 ± 1.3 µg/mL	ICP/ICP-MS	3162a

Matrix: 5% nitric acid with trace hydrofluoric and tartaric acids in water

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Traceability:

Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCCL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:

Uncertainties in certified values are estimated in accordance with ISO Guides 34 and 35, and include assessments of the uncertainty contributions resulting from the gravimetric characterization of the reference material (u_{char}), the packaging of the reference material into individual units (u_{bb}), the transportation of the reference material to the end user (u_{sts}), and the long term storage of the reference material (u_{lts}). The uncertainty (U) is reported as an expanded uncertainty calculated as:

$$U = k\sqrt{u_{char}^2 + u_{bb}^2 + u_{sts}^2 + u_{lts}^2}$$

using a coverage factor of $k=2$, which gives a level of confidence of approximately 95%.

Description:

This RM was manufactured using purified acids and 18 megohm double deionized water, and is packaged in sealed, low density polyethylene (LDPE) bottles.

Storage:

Store at Room Temperature (15° to 30°C).

Store the RM according to directions noted above. Keep container tightly closed in a dark, dry, and well-ventilated place. Extended storage at temperatures below 4°C or above 35°C is not recommended. Protect from light.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the bottle and should be processed without delay for the certified values to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipeting to the bottle. Tightly cap the bottle after removing any of the material, and store according to the instructions noted above. Since this is a solution, there is no minimum subsample size required to be drawn.

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The certification of this CRM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the CRM is handled and stored in accordance with instructions given in this certificate. This certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

The long term stability of this RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Product Hazards:

Material Safety Data Sheets are available on ULTRA's web site or by contacting our Technical Service department.