Certified Reference Materials for UV, Visible, NIR and IR Molecular Spectroscopy

RM-HL

Set Serial No: 28318

Customer Details:

Starna Cells Inc
5950 Traffic Way
Atascadero
C.A. 93422
U.S.A.

The customer information stated on this page, number 1 of 3 applies to all certificates.

UKAS accreditation applies to all Wavelength, Transmission/Absorbance, Stray Light references, and those used for Resolution measurements.

UKAS CALIBRATION 0659

UKAS REFERENCE MATERIALS 4001

Reference Material
Certificate of Calibration and Traceability

Calibration Lab.
Starna Scientific Ltd
52/54 Fowler Rd
HAINAULT
Essex IG6 3UT
England
Tel. +44 (0) 20 8501 5550

Email: sales@starna.com

Holmium oxide in perchloric acid sealed in a quartz cell for use as a wavelength accuracy reference in the UV and visible spectrum

Certificate Number: **74184**
Certificate Date: **15 January 2019**
Expiration Date: **15 January 2021**
Analysis Number: **HL421101**
Set Serial Number: **28318**
Cell Serial Number: **78662**

0659

Description of Reference Material:

This reference material consists of an aqueous solution of 4% holmium oxide in 10% perchloric acid which is permanently sealed by heat fusion in a high quality far UV quartz cell. The reference material is designed for the verification and calibration of the wavelength scales of visible and ultraviolet spectrophotometers having nominal spectral bandwidths of 5 nm or less. All procedures are implemented in accordance with ISO/IEC 17025 and ISO 17034. Additional information can be found on the Starna web site at www.starna.com

Certified Values of Reference Material:

The holmium oxide filled cell is measured in the absorbance mode against an air blank, over the wavelength range of 660 to 230nm. For each spectral bandwidth, a baseline correction is performed with an empty cell holder.
The 14 maximum absorption peaks are identified and certified to be within the expected wavelength range tolerance for each spectral bandwidth (SBW) as specified by the NIST reference control.

The combined analytical and instrument uncertainties at a coverage probability of 95 % is 0.11 nm.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2. providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements

SBW	Wavelengths in nanometers of peak maxima as referenced to air, +/- 0.11nm													
0.10	640.41	536.42	485.20	467.78	452.02	416.02	385.36	361.27	345.46	333.48	287.03	278.15	249.78	240.97
0.25	640.41	536.43	485.21	467.79	451.98	416.04	385.39	361.27	345.45	333.47	287.04	278.15	249.79	240.98
0.50	640.43	536.45	485.21	467.80	451.91	416.07	385.45	361.27	345.43	333.47	287.08	278.15	249.81	241.02
1.00	640.50	536.56	485.23	467.82	451.45	416.25	385.61	361.25	345.38	333.48	287.22	278.13	249.89	241.12
1.50	640.62	536.71	485.26	467.86	451.33	416.42	385.70	361.18	345.38	333.49	287.40	278.11	249.98	241.13
2.00	640.79	536.86	485.25	467.90	451.32	416.57	385.80	361.12	345.42	333.47	287.52	278.10	250.03	241.12
3.00	641.15	537.21	485.21	468.11	451.36	416.89	386.00	361.11	345.53	333.47	287.57	278.05	250.07	241.04
4.00	641.42	537.58	485.26	473.53	451.41	417.07	386.31	361.14	345.57	333.47	287.64	277.98	250.11	241.00
5.00	641.66	537.91	485.25	473.35	451.40	417.32	386.44	361.13	345.58	333.47	287.78	277.93	250.15	240.97

Certifying Instrument Qualification:

All calibration is performed on one of a series of high performance reference spectrophotometers. The instruments are tested and qualified to the manufacturer's published specification over the analytical range used for the reference material certification.
The following primary references and fundamental procedures are used in the qualification of the reference spectrophotometers:

Absorbance:	NIST SRM 2031, 1930 & 930e, Double aperture method
Wavelength:	NIST SRM 2034, Emission lines of Hg & deuterium
Stray Light:	NIST SRM 2032, KCl, KI & lithium carbonate
Resolution:	Benzene vapor, half width of D2 656.1 nm line

Calibration Method:

The conditions of analysis used to generate the certified values on this certificate are as listed in the chart below:

Cell Pathlength:	10 +/- 0.01mm
Cell Material:	Spectrosil Quartz
Reference:	Air
Scale:	Absorbance
Range:	660 to 230 nm
Band width:	Multiple
Temperature:	23.5° C +/- 1.0 °C

Instructions for Use:

Carefully insert the holmium filled cell into the cell holder of your instrument touching only the frosted sides or by holding the top of the cell. The cell is fragile and should always be handled with care. Leave the reference cell holder empty as all measurements are to be made against air. Measurements should be made within the temperature range of 20° to 30° C. In the absorbance mode scan the cell over the required range. Find the absorbance maxima and compare them to the certified wavelengths on this certificate as indicated for the spectral bandwidth (SBW) used by your instrument. If you find any significant differences, it is recommended that a service technician inspect your instrument to determine the source of the discrepancy.

Instrument Dependencies:

The instrument to be tested should be set at a SBW not exceeding 5 nm. Consult the instrument owners handbook for this information.

Duration of Certificate:

This certificate is valid for a maximum period of two years from the date of issue or sooner if specified by the user's own protocols. Although the references are covered by a lifetime guarantee this is subject to certain conditions, see guidance notes.

Re-certification Procedure:

All reference materials are certified and supplied in a useable condition. There is no warranty for fitness beyond receipt by the customer. When references need to be re-certified or inspected for any reason, customers should return them to the Starna ISO/IEC 17025 & ISO 17034 accredited calibration laboratory, where all original data is collated.

On receipt by Starna Scientific the references are measured "As received", before cleaning under the re-certification procedure. "As received" data is available on request.

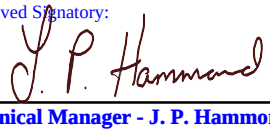
Storage and Care:

References should always be stored in the box provided and handled with extreme care. Quartz cells are fragile and should be inserted and removed from the instrument by holding the cell cap, taking care not to twist or apply leverage against the cell holder, as this may crack the cells. Damage in the form of scratches may alter the certified values significantly such that they need re-certifying and may, as with cracks, require complete replacement. For cleaning see guidance notes.

Calibration performed by:

Calibration Manager - A. Wakelin CSci CChem MRSC

Approved Signatory:



Technical Manager - J. P. Hammond CSci CChem FRSC