Report on the Calibration of Three Neutral Density Filters and One Holmium Filter

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Description and Identification

Three neutral density glass filters and one holmium filter. The filters were mounted in standard sized spectrophotometer sample holders.

The filters were supplied in a container labelled as follows:

Perkin Elmer Standard for UV/Vis
Spectrophotometry B050 - 7805

The filters were labelled on their holders and the glass as follows:

Holder	Glass	
G1	G1	1886
G2	G2	1886
G3	G3	1506
H	Ho	1826

Client

New Zealand Scientific Ltd, Kyocera Building, 1 - 3 Parkhead Place, Albany 0632, Auckland

Date of Calibration

4 to 9 February 2009.

Objective

- Neutral Density Filters

  To calibrate the optical density of the three neutral density filters at the following wavelengths: 440 nm, 546.1 nm, and 635 nm.

- Holmium Filter

  To calibrate the wavelengths of the absorption peaks in the filter at the following nominal wavelengths: 279 nm, 361 nm, 460 nm and 536 nm.

Technical Procedure

MSLT.O.006.007

Method of Calibration

Before calibration the filters were removed from their holders and cleaned using methanol and lens tissue.

- Neutral Density Filters

  Transmittance measurements were made on the filters using a high accuracy spectrophotometer system. Measurements were made on the central 4 mm x 10 mm area of the filters using collimated light at the required wavelengths and with a bandwidth of 1.0 nm. The optical densities (OD) of the filters were calculated from the transmittance values (T) using the formula:

$$OD = -\log_{10}T$$

- Holmium Filter

  The spectral transmittance at wavelengths around the absorption peaks of the filter were measured on a high accuracy spectrophotometer system using collimated light with a bandwidth of 0.2 nm. Measurements were made at wavelength intervals of 0.1 nm through the peaks to find the wavelength of minimum transmittance.

Conditions

These calibration were carried out at a room temperature of 20 °C ± 0.5 °C.

Results

- Neutral Density Filters

  The following table lists the neutral density filters, the wavelength of calibration and the corresponding optical density.

Wavelength	Filter Identifier		
nm	G1	G2	G3
440	0.338	0.989	0.499
546.1	0.307	0.946	0.467
635	0.332	0.941	0.483

- Holmium Filter

  The following table lists the wavelengths of minimum transmittance of the absorption lines for the holmium filter.

279.3 nm
360.8 nm
460.2 nm
536.3 nm

Uncertainty

The uncertainty in the optical density values at the 95% confidence level and with a coverage factor of 2.5 is 0.002. The uncertainty at the 95% confidence level in the wavelength is 0.3 nm with a coverage factor of 2.2. (See ISO guide to the Expression of Uncertainty in Measurement 1995, for an explanation of terms.)

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