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LOW OPTICAL ABSORPTION MEASUREMENT REPORT

SAMPLE: PO6138

Request from		Testing institute	
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Contact person	Vaida Grašytė	Tester	Edvinas Zacharovas
Inquiry ID	3001	Sale order	SO4017
Purchase order	PO6371	Test ID	K38G7E
		Test date	2023-07-24

Specimen

Name	PO6138
Type	Polarizer Coating (Rs > 99.9% @ 1020 nm - 1040 nm + Tp>99.0% @ 1020 nm - 1040 nm)
Dimensions	Ø12.7 x 3.0 mm
Packaging	Plastic box
Storage before test	Normal laboratory conditions
Dust blow-off	None
Cleaning	None

Measurement

Method	Photothermal common-path interferometry (PCI)
Protocols	Longitudinal scan (L-scan), Time scan, Transverse scan (T-scan).

SUMMARY OF MEASUREMENT RESULTS

Wavelength	AOI	Polarization	Location	Sample absorption *
1070.0 nm	49.0 deg	Linear S	Front surface (S1)	$2.16^{+0.29}_{-0.32}$ ppm

* Sample absorption is evaluated from Transverse scan protocol.

TEST EQUIPMENT

Definitions and test description

Photothermal common-path interferometry (PCI) for low absorption measurements is based on spatially resolved pump-probe techinque: low power probe beam senses the heating effect of an absorbed pump beam [1]. Several different scanning protocols are performed to measure the absorption of the sample.

Irradiation sources	Pump laser	Probe laser
Manufacturer	IPG Photonics	Lumentum
Model	YLR-10-LP	1122P
Type	Continuous wave Ytterbium fiber	Continuous wave HeNe
Central wavelength	1070 nm	632.8 nm
Angle of incidence	(49.0 ± 1.0) deg	(56.0 ± 1.0) deg
Polarization state	Linear S	Linear S
Spatial beam profile in target plane	TEM00	TEM00
Beam diameter in target plane (1/e2)	(59.6 ± 5) µm	(210 ± 5) µm
Average power	(3.9917 ± 0.0037) W	(2.00 ± 0.05) mW

Measurement setup calibration	Surface
Calibration sample	UVFS Metallic Filter
Absorption	23.9 %
Correction fator	1.0
Responsivity	$54.0^{+0.8}_{-1.0}$ 1/W

Power meter	
Manufacturer	Ophir
Model	12A-P
Calibration due date	2024-04

Test environment	
Environment	Air
Cleanroom class (ISO 14644-1)	ISO7
Pressure	1 bar
Temperature	22 C
Humidity	65 %

[1] A. Alexandrovski, M. Fejer, A. Markosian, and Roger Route "Photothermal common-path interferometry (PCI): new developments", Proc. SPIE 7193, Solid State Lasers XVIII: Technology and Devices, 71930D (28 February 2009)

LONGITUDINAL SCAN (L-SCAN) RESULTS

Scan parameters

Scanning axis	Longitudinal (from S1 to S2)
Scanning distance	3.5 mm
Scanning step	20 µm
Pump laser power	(3.9917 ± 0.0037) W
Number of scans	1

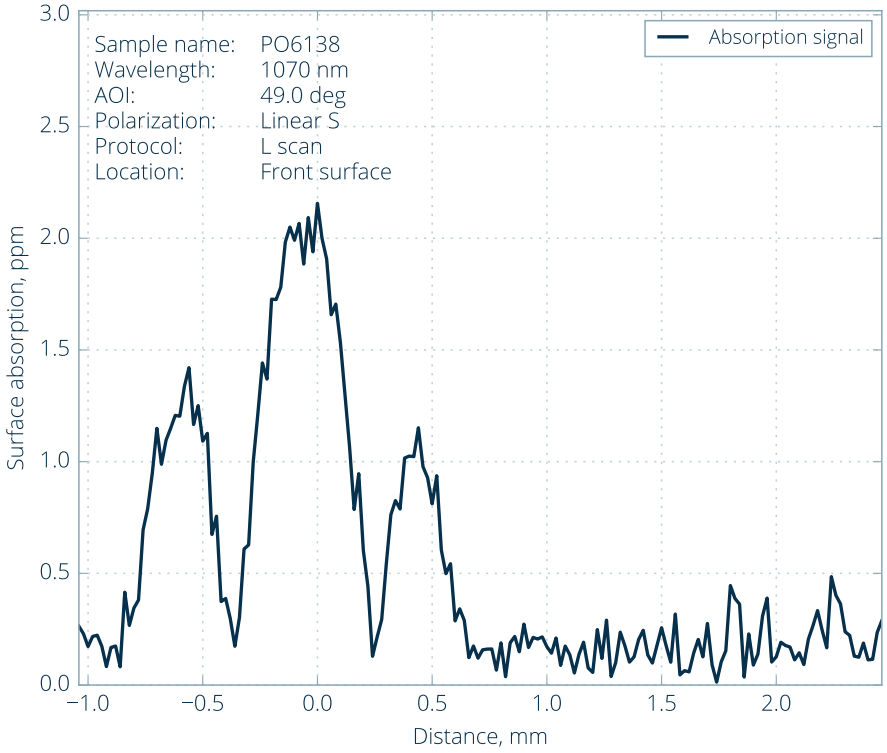


Figure 1. Longitudinal scan.

TIME SCAN RESULTS

FRONT SURFACE (S1)

Scan parameters

Scanning axis	Time
Scanning duration	685 s
Scanning step	1 s
Pump laser power	(3.9917 ± 0.0037) W
Number of scans	1

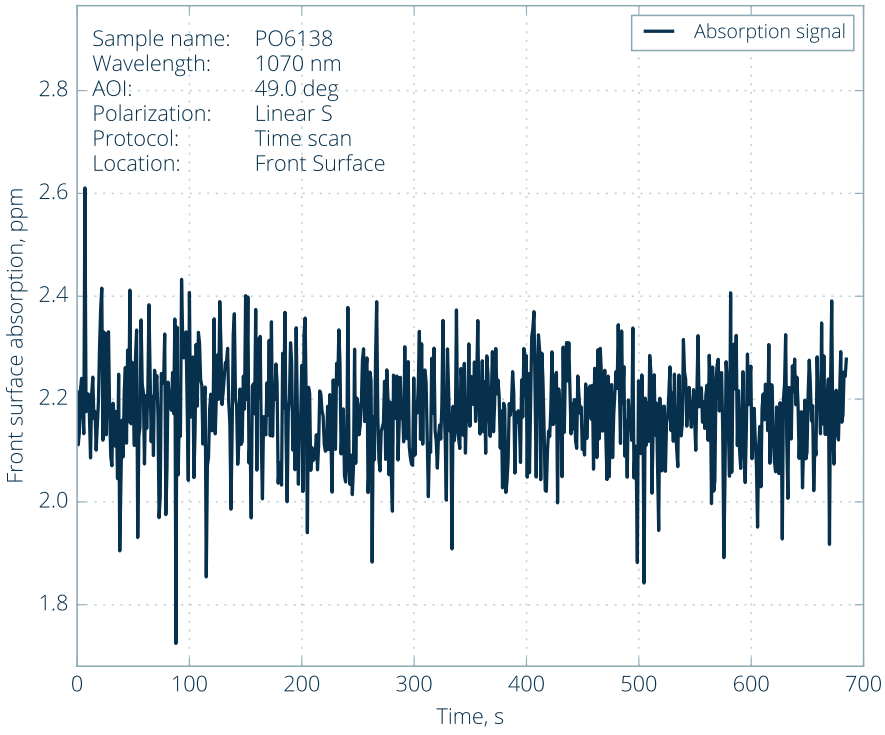


Figure 2. Time scan on front surface (S1).

TRANSVERSE SCAN (T-SCAN) RESULTS

FRONT SURFACE (S1)

Definitions and protocol description

Sample absorption is defined as median absorption value of T-scan measurement. Uncertainty is evaluated as minimum and maximum absorption values of T-scan measurement without outliers, i.e. within range [Q1 - 1.5 · IQR, Q3 + 1.5 · IQR], where Q1 - first quartile, Q3 - third quartile, IQR - interquartile range.

Scan parameters

Scanning axis	Transverse (vertical)
Scanning distance	3.0 mm
Scanning step	35 µm
Pump laser power	(3.9917 ± 0.0037) W
Number of scans	1

Scan results

Sample absorption	$2.16^{+0.29}_{-0.32}$ ppm

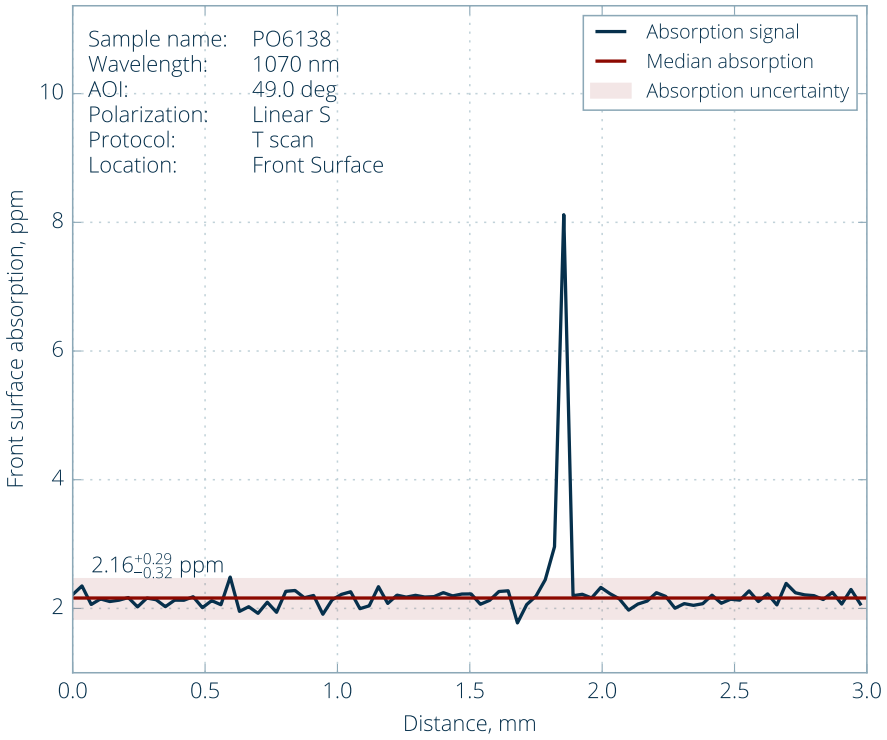


Figure 3. Transverse scan on front surface (S1).