Summary of Holographic Glass Properties

1 Scope

This document provides information on the properties and characteristics of the Ondax holographic glass when in the state of a final product.

2 Optical

2.1 Index of Refraction

The index at wavelength **1** (in micrometers) is given by the formula:

$$n = \sqrt{\left(2.21776 - 5.34442 \times 10^{-3} \cdot \lambda^2 + 1.18996 \times 10^{-2} \cdot \lambda^{-2} + 1.54366 \times 10^{-4} \cdot \lambda^{-4}\right)}$$

. This formula is accurate to within 10^3 in the wavelength range of 405 nm to 1570 nm.
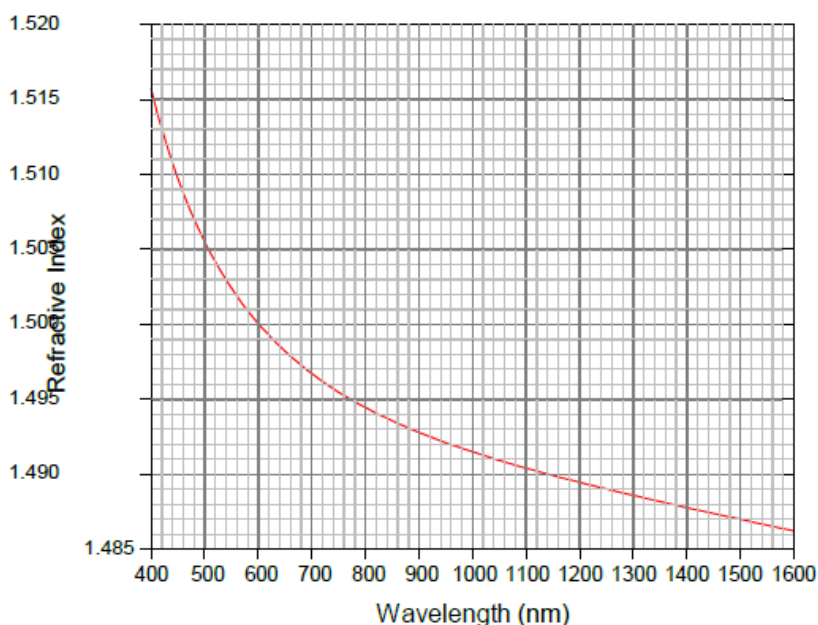
Figure 1

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3 Reliability

3.1 Accelerated Aging

Two physical parameters impact the center wavelength and efficiency (strength) of a volume holographic grating: refractive index and modulation depth. A strong 14 mm long grating was recorded in the Telecom Cband (nominal 1550 nm) using an e-beam fabricated phase mask. The extremely high precision of the e-beam fabrication process provides exact knowledge of the grating period recorded into the material, which is independent of refractive index and recording laser wavelength.

The refractive index can be calculated by measurement of the filter's center wavelength using the equation $\lambda = 2n\Lambda$ where **1** is the measured center wavelength, n is the refractive index, and L is the known grating period.

The refractive index modulation depth, Dn, is calculated from measurement of the bandwidth of the grating. For strong gratings, the -0.5 dB bandwidth of the filter response is approximately linear with Dn, as determined through simulation.

Accelerated aging was performed at 150° C.

Figure 2 shows the measurement of refractive index after time spent at 150° C. The error is composed of
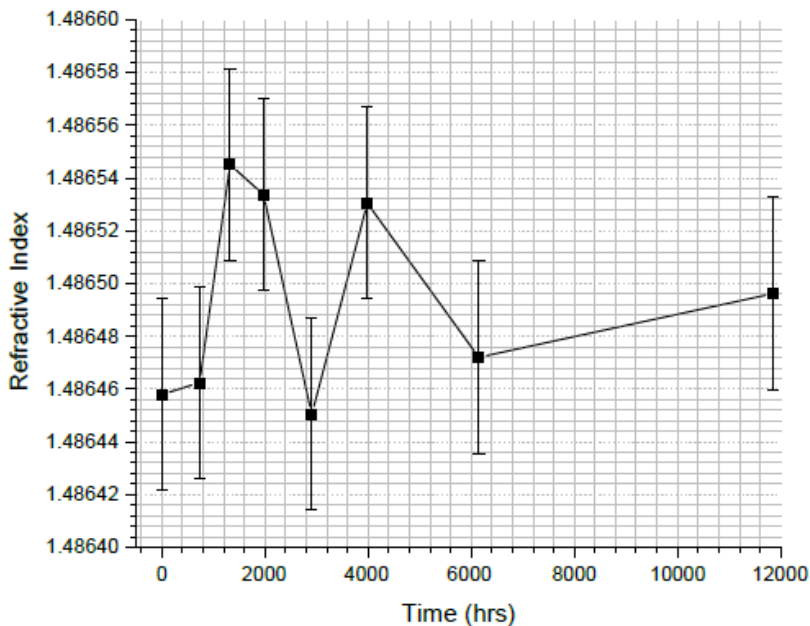

Figure 2

a +/-2° C temperature uncertainty plus the 10 pm accuracy of the laser used to read out the filter.

Figure 3 shows the refractive index modulation depth after time spent at 150° C. The error is computed
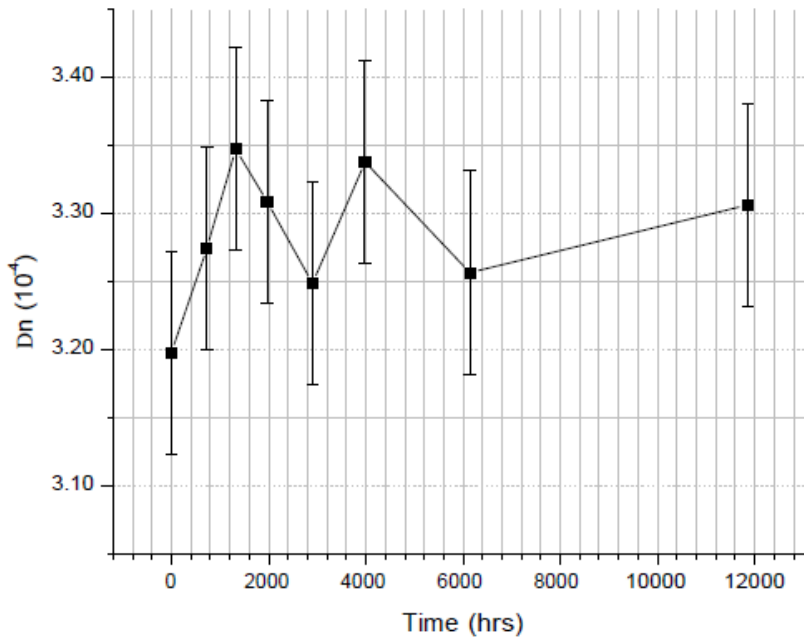

Figure 3

from the 10 pm accuracy of the laser used to read out the filter.

In both cases a lifetime or decay time constant cannot be determined because there is no observable change within the measurement resolution.