Direct Laser Writing of Nanophotonic Structures on Contact Lenses

Bader AlQattan[1,*], Ali K. Yetisen,[2] and Haider Butt[1,*]

[1]Nanotechnology Laboratory, School of Engineering, University of Birmingham, Birmingham B15 2TT, UK.

[2]School of Chemical Engineering, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

*E-mail: BXA301@bham.ac.uk, h.butt@bham.ac.uk. Tel.: +441214158623

Preparation of the lenses. The black ink was spincoated on 1 mm thick glasses at a speed of (200-1200 rpm). The transmission decreased with lower spincoating speed and higher layer thickness (Figure a). The diffraction intensity of first order increased with increasing thickness of the ink layer (Figure b). Similarly, we compared the transmission of black dye with its thickness on contact lenses to find an optimum thickness of near 915 nm (or 900 nm).

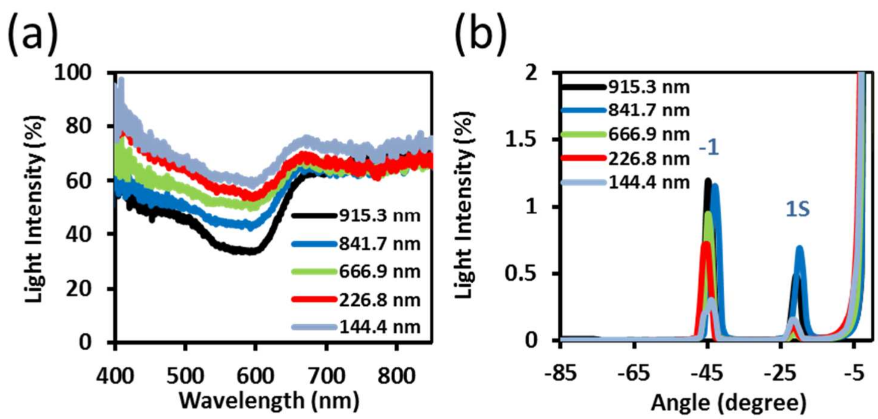

Figure S1. Black ink gratings at different thicknesses in (a) transmission, (b) diffraction modes.

The 915 nm thickness was chosen as the best medium thickness for the subsequent experiments. Using laser interference in Denisyuk reflection mode, the material thickness must be reasonable to allow the laser waves to pass through any substrate to produce the ablative reflection waves. If the material does not transmit the laser waves, the medium would burn it or not respond. In addition, if the absorption reaches zero or 100% transmission, the target material would not interact with laser wave.

Table S2. Properties of the contact lenses

Name	1-DAY ACUVUE TruEye
Material	narafilcon A
Manufacturer	Johnson & Johnson
Water content (%)	46%
FDA group	V
Centre thickness (mm)	0.075
Oxygen permeability (x10^{-11})	100
Principal monomers	MPMDSM, DMA, HEMA, siloxane macromer, TEGDMA, PVP

Table S3. Dissolved NaCl in DI water at different concentrations and ellipsometry equivalent reading of refractive index values.

NaCl (g)	**NaCl (mmol L^{-1})**	**Ellipsometry readout**	**Refractive index, n_o**	**Diffraction**
0	0	1	1.33	45^o
0.2	230	2	1.34	47.3^o
0.4	460	3	1.34	47.3^o
0.6	690	4.5	1.34	47.5^o
0.8	920	5.0	1.34	48.1^o
1.0	1149	6.5	1.34	49.1^o
1.2	1379	7.5	1.35	51.6^o