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PRINTING NANOSTRUCTURES ON CONTACT LENSES FOR WEARABLE DIAGNOSTICS

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The key challenge for producing nanostructures based commercial healthcare applications is the scaling up of the fabrication process. We present the fabrication of dye based nanostructures by using the fast and commercially viable method of holographic laser ablation. In this method, we use a single beam of a nanosecond laser, which after reflecting from a mirror self-interferes. This results in an interference pattern which can be used to ablate well-ordered gratings in thin films. The period of the grating is determined by the incident wavelength (λ) and tilt angle (θ) of the sample with respect to normal incidence. In this manner, we recorded various holographic nanopatterns onto transparent substrates, such as glasses and commercial contact lenses (Fig. 1). Using this quick, scale and economical method we produced several wearable contact lens sensors. These contact lens based holographic sensors can be used for monitoring the eye curvature and pressure of glaucoma patients. The holograms can also be functionalized to sense glucose concentrations in the tears of diabetic patients. The findings have been reported in highly reputable journals and have also received a lot of media attention. The approach was also extended into 3D patterning by ablating 3D assemblies of Ag nanoparticles within polymer media. Through laser ablation, ordered 3D geometries/patterns were written within the polymer layers. These reconfigurable geometries act as holographically recorded optical devices

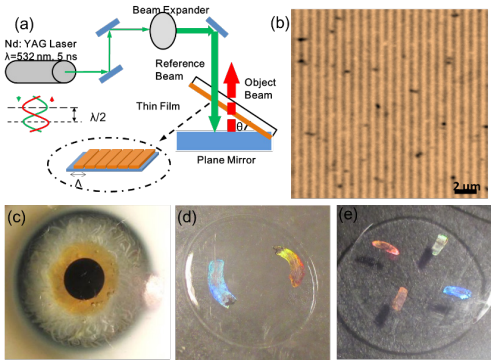

Figure 1: **(a) Holographic laser ablation process, (b) the nonpatterns produced, (c-e) holograms printed on commercial contact lenses**

Biography

Haider Butt is serving as a Senior Lecturer at the University of Birmingham, UK, where he is leading a Nanophotonics group with particular interests in healthcare technologies. Previously, he was a Henslow Research Fellow at the University of Cambridge, from where he also received his PhD in April 2012. He has published over 100 papers in various peer-reviewed journals and has around 40 conference publications. His research work has received substantial recognition in the form of awards and media interviews. He has secured several prestigious research awards including Philip Leverhulme Prize.

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