Multimaterial 3D Printed Smart Contact Lenses

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Multimaterial 3D printing is a novel technology with exciting potential. This study explores the use of vat photopolymerization-based 3D printing to build multimaterial hydrogel based contact lenses, which exhibit multiband optical filtering properties (amongst other sensing application). Such hydrogel devices can be useful for treating ocular diseases including Color Vision Deficiency (CVD) or color blindness. There are several types of CVDs and they occurs in patients with varying degree of severities.[1,2] The 3D printing of multimaterial and multi-filtering contact lenses (Fig. 1), delivers a promising approach for providing a customised solution to colour blind patients – tinted lens tailored to each patient's needs. The printed multimaterial lenses were examined for their optical and mechanical characteristics, along with hydration behaviour. The optical qualities of the contact lenses were found to be unaffected by the multimaterial printing technique. Due to multiple tinting dyes that were utilized, the printed multimaterial contact lenses provided a combined multi-band filtering property for color blindness correction (Fig. 2). The obtained optical spectrum closely matched the color blindness correcting glasses that are readily available on the market.

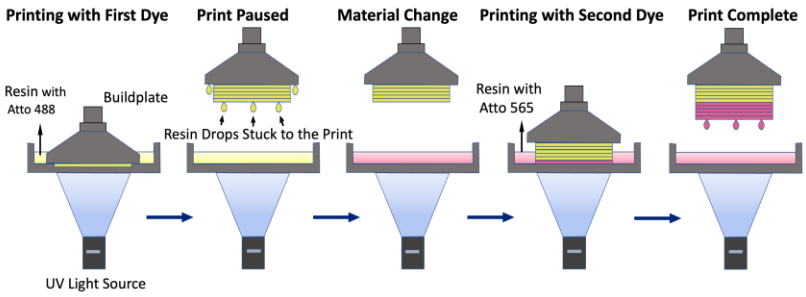

Fig 1: Multimaterial DLP printing process used in this study.

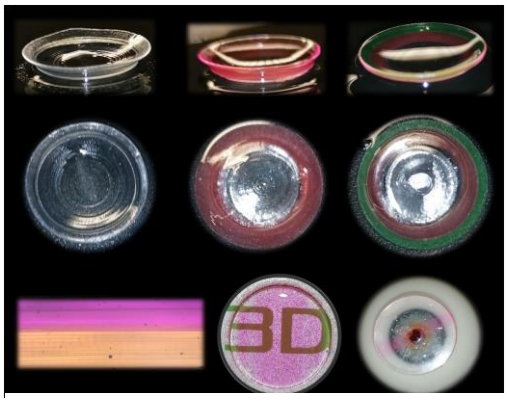

Fig 2: Multimaterial 3D printed contact lenses. Rigth top: clear contact lenses. Middle: clear + pink lenses. Left: clear, pink and yellow lenses.

References:

[1] F. Alam, A. E. Salih, and H. Butt, "Development of 3D-Printed Glasses for Color Vision Deficiency," Adv Eng Mater, Oct. 2022.

[2] F. Alam, A. E. Salih, and H. Butt, "3D printed contact lenses for the management of color blindness," Addit Manuf, vol. 49, Jan. 2022.