Regenerated Polymer Optical Fibre Bragg Gratings for Cochlear Implantation

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Hearing loss is a global health concern with a rapidly rising prevalence. Cochlear implantation is a well-established surgical intervention for hearing restoration in patients suffering from severe to profound sensorineural hearing loss. Polymeric optical fibres (POFs) have increasingly garnered research interest in biomedical applications due to their numerous inherent properties. The new class of POFs composed of the cyclo olefin polymer, ZEONEX (E48R/480R) [1] exhibit low affinity toward moisture making them excellent candidates for optical sensing in aqueous domains.

Recent investigation of temperature response of ZEONEX-based polymer optical fibre Bragg gratings (POFBGs) inscribed with 248 nm UV irradiation led to the revelation of regenerated polymer optical fibre Bragg gratings (RPOFBGs) capable of withstanding exceptionally high temperatures of up to 132 °C [2]. We demonstrate the thermal sustainability and Raman spectroscopic structural analysis of these speciality RPOFBGs and integration of them with cochlear implants useful for real-time feedback on surgical navigation. The absence of any risk of fibre breakage, low stiffness levels, ability to withstand temperatures of 100 to 120 °C and insensitivity towards humidity which are imperative for the cochlear implant manufacturing process, verify the prospects of these RPOFBGs for clinical translation.

[1] X. Cheng, D.S. Gunawardena, C.F.J Pun, J. Bonefacino and H.Y. Tam, *Opt. Express*. **28**, 33573 (2020).

[2] D.S. Gunawardena, X. Cheng, J. Cui, G. Edbert, L. Lu, Y.T. Ho, and H.Y. Tam, *Photon. Res*. **10**, 1011 (2022).