



Deposited via The University of Leeds.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/id/eprint/97126/>

Version: Accepted Version

Proceedings Paper:

Chandrappan, J, Kakkar, T, Murray, M et al. (2014) Engineering of planar optical waveguides on Silica glass using femtosecond pulsed laser deposition. In: 6th International Conference on Optical, Optoelectronic and Photonic Materials and Applications. ICOOPMA 2014, 27 Jul - 01 Aug 2014, Leeds.

Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

Engineering of planar optical waveguides on Silica glass using femtosecond pulsed laser deposition

Jayakrishnan Chandrappan¹, Tarun Kakkar¹, Matthew Murray¹, D.P.Steenson², Animesh Jha¹, Gin Jose¹

¹*Institute for Materials Research, School of Process, Environmental and Material Engineering.*

²*Institute of Microwave and photonics, Electronic and Electrical Engineering*

Faculty of Engineering, University of Leeds

pmcj@leeds.ac.uk

We report the fabrication of planar optical waveguides using multi ion diffusion by femtosecond laser ablation. A real-time implantation of Te^{3+} , Zn^{2+} , Na^{+} ions along with rare earth ion Er^{3+} in oxygen plasma is achieved (fig.1). The planar waveguides are analysed using prism coupling method to understand the modal behaviour. Optical characteristics specify a high refractive index contrast optical waveguide layer formation, ensuring a thickness up to $3.2\text{ }\mu\text{m}$ with 1.6 refractive index at 1550 nm optical communication wavelength. An overall optical transparency $>90\%$ is well observed in the 800-1700 nm NIR range using transmission spectroscopy (Fig.2), making it suitable for photonic applications. The effect of various process parameters like laser pulse energy, pulse repetition rate, pressure and temperature effects are studied in detail. The impact of these parameters on guide layer formation will be presented in this work.

The distinctive prospect of engineering the silica glass using multi ions releases a new domain in photonics device application for communication as well as in sensing.

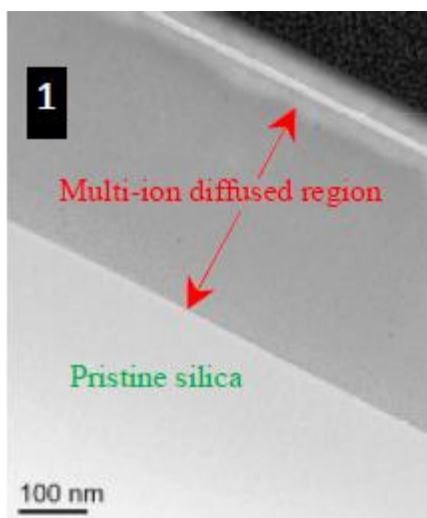


Fig.1

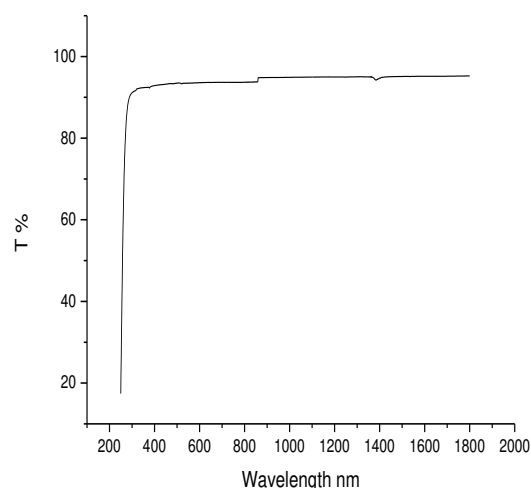


Fig.2