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

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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 µm 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.

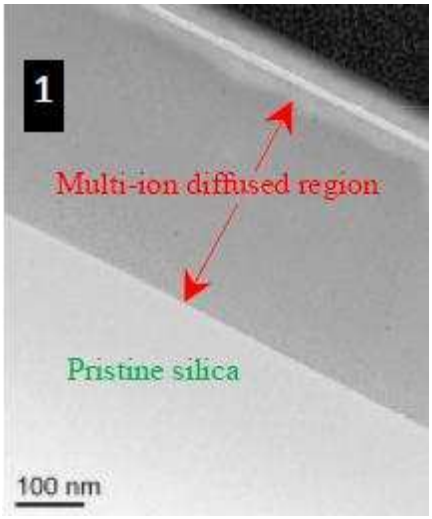

Fig.1

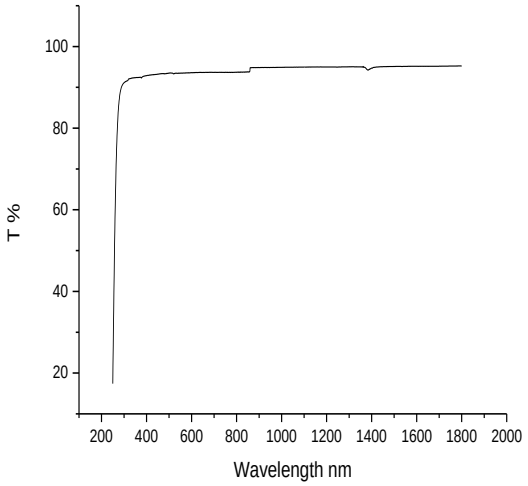

Fig.2