EMBEEDED AND BURIED POLYMER WAVEGUIDES: DESIGN, FABRICATION AND CHARACTERIZATION.

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Due to their low cost fabrication and their high-volume manufacturing production, polymer waveguides are becoming an optional solution to silicon based optical communication systems. Polymer optics feature sizes down to 100nm, and can congregate all challenges needed for high quality optical communications systems. A key outcome of embedded and buried symmetrical waveguides is that they could be used for waveguiding photonic crystal structures, since a low light leakage from guiding layer is realized.
Our work is concentrated on the design and fabrication of embedded and buried waveguide system. Control of adhesion between polymer layers and filling in the grooves on pre-patterned polymer substrates, are the key issues that are presented. We demonstrate two buried waveguides, namely polystyrene/Teflon and mr-L6000/Teflon, fabricated by means of nanoimprint lithography and/or electron beam lithography respectively. For both waveguides, we realize a low confinement of the waveguiding mode in the core due to the low refractive index contrast (around 0.05-0.2). This formation gives flexibility to reduce waveguide optical losses if the losses of the core polymer are too high, which is usually the case in near infrared for all easily processed polymers. The fabrication of buried 1D and 2D photonic crystal waveguiding structures and characterization of these devices are in progress.

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