A PSQ-L polymer microring resonator fabricated by a simple UV-based soft-lithography process

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Photonic integrated circuits based on polymer waveguides have great potential to reduce cost due to simple fabrication processes. Apart from conventional lithography and etching, the fabrication process for the waveguides can be simplified by using soft-lithography [1, 2] or nanoimprint lithography (NIL) [3].

A novel polymer PSQ-L was introduced recently for optical applications [4].This polymer film shows good optical properties and high thermal stability (1% Td is above 300℃ in air and 340℃ in nitrogen).

The polymer PSQ-LH is used as a core material and polymer PSQ-LL is used as a cladding material. The polymer waveguides are fabricted by a simple UV-based soft-lithography. Unlike in conventional imprint processes, the imprint is first done on the cladding layer of PSQ-LL and followed by spin-coating of the core layer PSQ-LH to fill the imprinted features in the cladding layer (Fig.1). The flexible PDMS mold made from an SU-8 master mold [2] is employed to do the imprint. This process smartly avoids the difficulties related to controlling the thickness of the residual layer typical for nano-imprint processes since the residual cladding layer thickness does not need to be controlled accurately as long as it is thick enough to eliminate the substrate leakage loss.

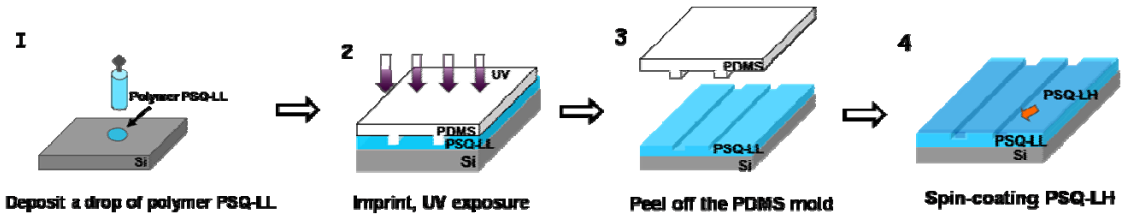

Fig. 1 Fabrication process flow of the polymer waveguides

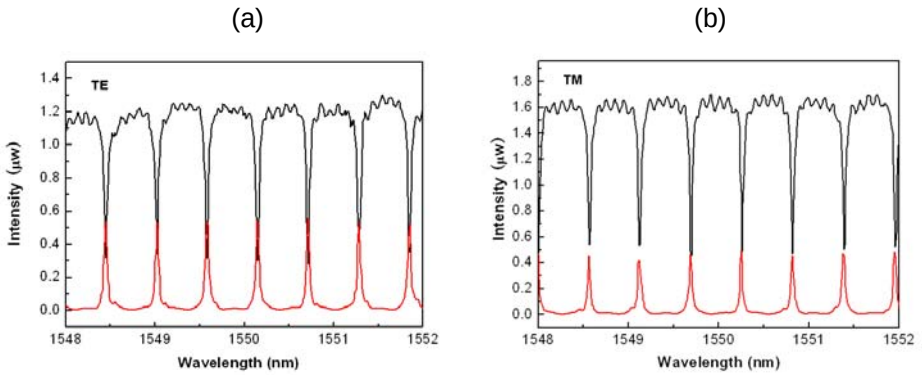

Fig. 2 Measured transmission spectrum of microring resonator (a) TE mode (b) TM mode

A laterally coupled microring resonator is designed and fabricated. After fabrication, the ring resonator is characterized. The measured transmission spectrum of the ring resonator is shown in Fig.2. The FWHM (Full Width of Half Maximum) is about 0.037nm. By taking the ratio between the resonance wavelength and FWHM, a Q factor of about 4.2×10^4 is calculated. About 6dB extinction ratio at the through port and 18dB extinction ratio at the drop port is obtained.

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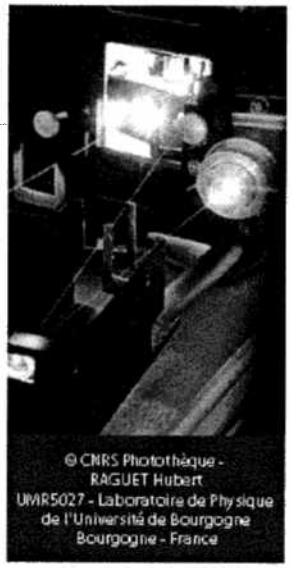

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