PMMA to SU-8 Bonding for Polymer Based Lab-on-a-chip Systems with Integrated Optics - DTU Orbit (20/10/2019)

PMMA to SU-8 Bonding for Polymer Based Lab-on-a-chip Systems with Integrated Optics

An adhesive bonding technique for wafer-level sealing of SU-8 based lab-on-a-chip microsystems with integrated optical components is presented. Microfluidic channels and optical components, e.g. waveguides, are fabricated in cross-linked SU-8 and sealed with a Pyrex glass substrate by means of an intermediate layer of 950K molecular weight polymethylmethacrylate (PMMA). Due to a lower refractive index of PMMA (n=1.49 at l=633 nm) in combination with good sealing of the microfluidic channels. The bonding strength dependence on bonding temperature and bonding force is investigated. A maximum bonding strength of 16 MPa is achieved at bonding temperatures between 110 oC and 120oC, at a bonding force of 2000 N on a 4-inch wafer. The optical propagation loss of multi-mode 10ym (thickness)x 30ym (width)SU-8 waveguides is measured. The propagation loss in PMMA bonded waveguide structures is more than 5 dB/cm lower, at wavelengths between 600nm and 900 nm, than in similar structures bonded by an intermediate layer of SU-8. Furthermore 950K PMMA shows no tendency to flow into the bonded structures during bonding because of its high viscosity.

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