Title: An optofluidic concept for a tunable micro-iris

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The present thesis deals with the development and fabrication of a tunable, optofluidic micro-iris, which is actuated mechanically. Based on two different presented design variants, the fabrication of the microfluidic structures, which is based on multi-level dry film resist technology, is described. Thereafter the fabricated micro- iris chips are evaluated.
The working principle of this stop is based on a previous concept, already established by N. Spengler (Lab. Micro-optics) in his diploma thesis. The laminar fluidic flow is exclusively controlled by capillary forces. Therefore, no channels (which would impair the optical quality of the stop) are needed for guiding the liquid flow.
The new design, developed in this work, uses highly transparent silicone oil instead of air as the second fluid ("index matching"), which requires a hydrophobic coating in the whole chip chamber. The oil in the chip chamber is drained through a buried microfluidic channel.
The optofluidic aperture stop is fabricated by a multi-photolithography process using several layers of dry film resist, which are successively laminated and structured. This method enables the fabrication of microfluidic channel networks and a pyramidal resist structure, which is the core of the capillary design concept. The final full-wafer bond, which encloses the fluidic system is performed with fluoropolymer coatings on the top and the bottom wafer.
Final transmission measurements demonstrate the improved optical performance of the oil filled optofluidic stop compared to the previous air filled variant. Moreover the experimental results verify the feasibility of the presented concept, whereas problems discussed in this chapter offer the possibility for further improvements.

Keywords: microiris, optofluidic, index matching, capillary pressure, ink, silicone oil.