Supplementary Material (ESI) for Lab on a Chip

A packaged optical slot waveguide ring resonator sensor array for multiplex label-free assays in labs-on-chip

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Supplementary information

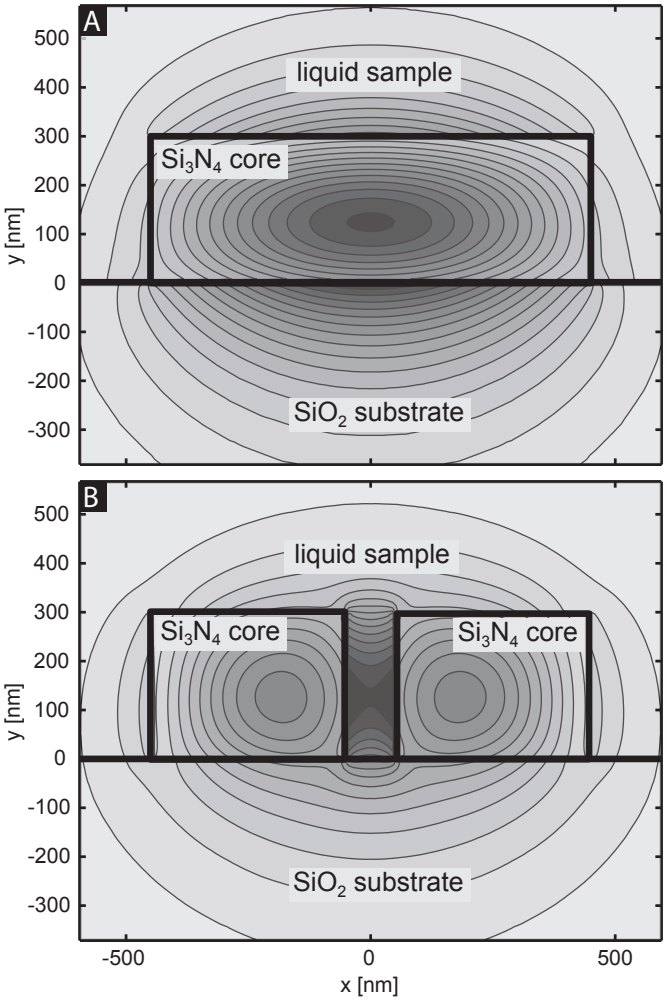

Figure S1: Slot waveguide sensor has more power in the sample. Contour plots of the si mulated averageoptical power density flowing through two different waveguide cross-sections at a wavelength of 1310 nm: (A) In the TM mode used for sensing with a strip waveguide, most of the optical power propagates in the waveguide core. (B) In the slot waveguide TE mode, however, up to half of the power propagates in the liquid sample, thus yielding a higher sensitivity to refractive index changes of the sample. The gray scales of the two mages have the same normalisation.

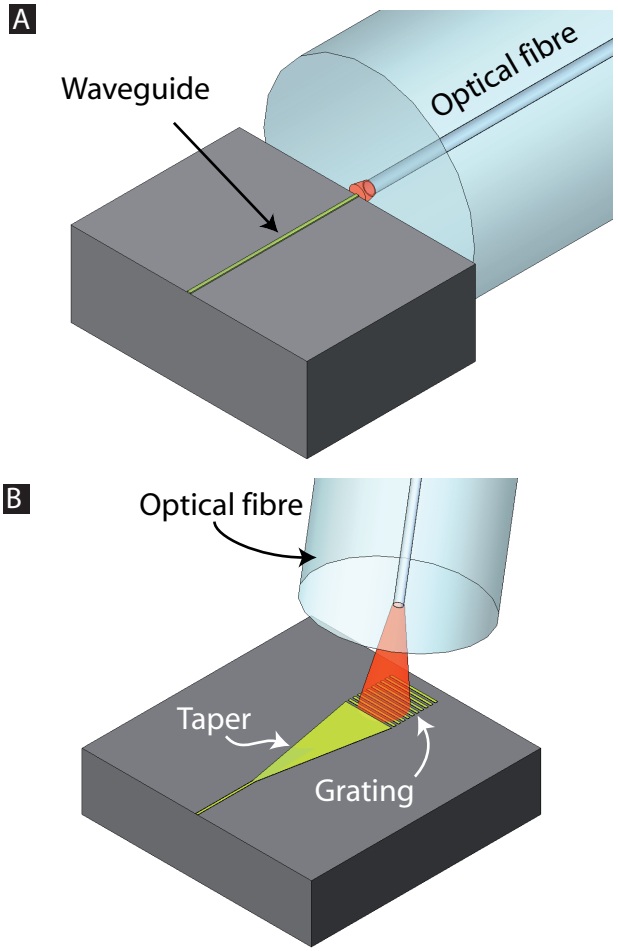

Figure S2: Relaxed alignment tolerance by using grating coupler. (A) Since the mode diameter of a single mode optical fibre is much larger than of an on-chip waveguide, the mode overlap is small, resulting in a low coupling efficiency. Furthermore, the small cross-section of the waveguide end face sets tight alignment tolerances. (B) By expanding the waveguide mode with a taper, and utilising diffraction in a surface grating to permit a placement of the fibre perpendicular to the surface, mode overlap is improved and alignment tolerances relaxed.

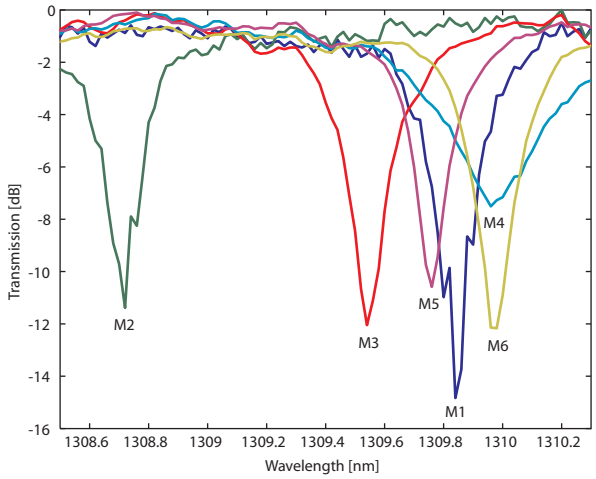

Figure S3: A superposition of the concurrently collected transmission spectra of resonators M1 to M6 operating in phosphate buffered saline (PBS) at a laser input power of 9 mW. The ring resonators display a throughput attenuation of -7 to -15 dB, a quality factor of a few thousand, and a free spectral range of 2.2 nm.