Electronic Supplementary Material (ESI) for Lab on a Chip

Optofluidic micro-sensors for the determination of liquid concentrations

Emanuel Weber*, Michael J. Vellekoop
Institute of Sensor and Actuator Systems, Vienna University of Technology, Austria
and Institute for Microsensors, -actuators and -systems, University of Bremen, Germany

* Corresponding author: Emanuel Weber

emanuel.weber@tuwien.ac.at

Supporting information:

Table S1. Parameters of the integrated optical components. Three air micro-lenses and one integrated waveguide

	lens incident	lens reflected	lens transmitted	integrated waveguide
left radius	**-0.45 mm**	**-0.60 mm**	**-0.60 mm**	**-**
right radius	**0.43 mm**	**0.70 mm**	**0.70 mm**	**-**
focal length	**0.71 mm**	**1.07 mm**	**1.06 mm**	**-**
numerical aperture	**0.50**	**0.53**	**0.54**	**0.26**
length	**-**	**-**	**-**	**2 mm**
width of core	**-**	**-**	**-**	**0.1 mm**

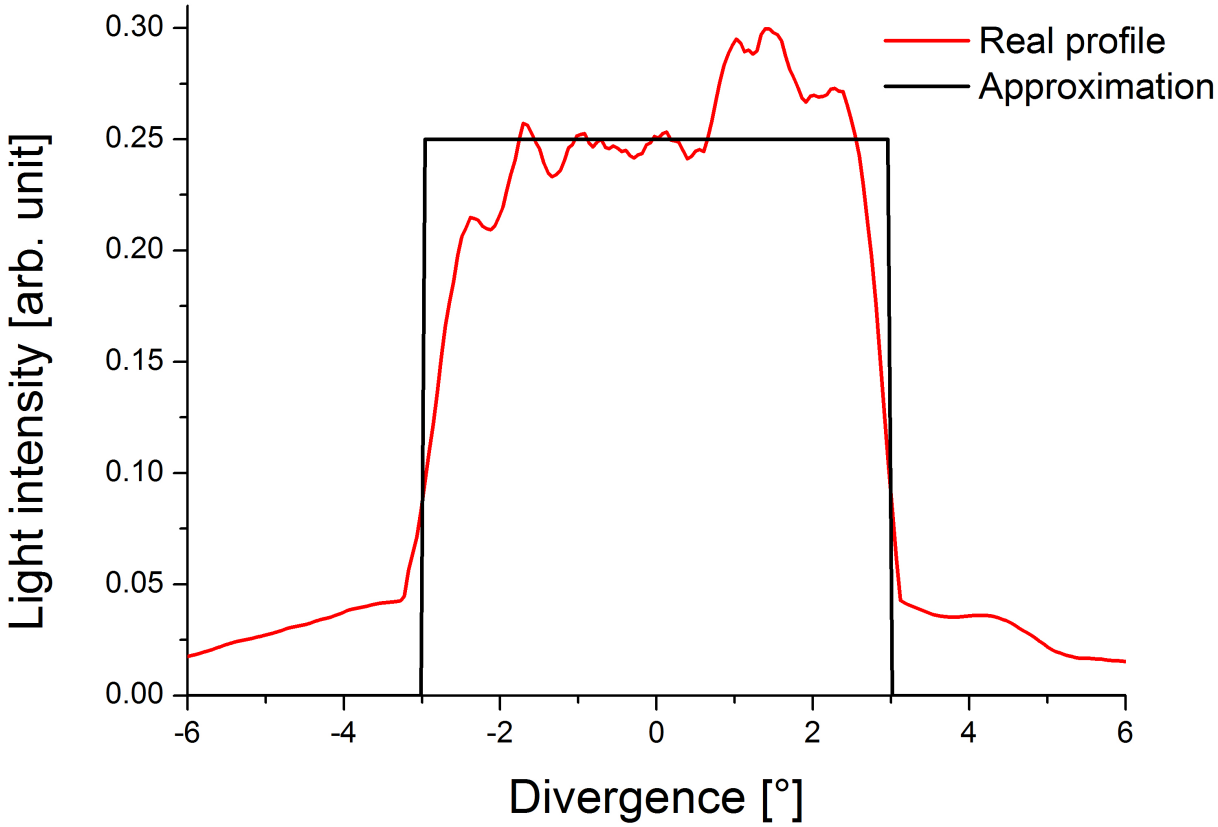

Figure S2. Incident beam optical power distribution right before the microfluidic channel. Between a divergence of -3° and 3° the profile was approximated as constant.

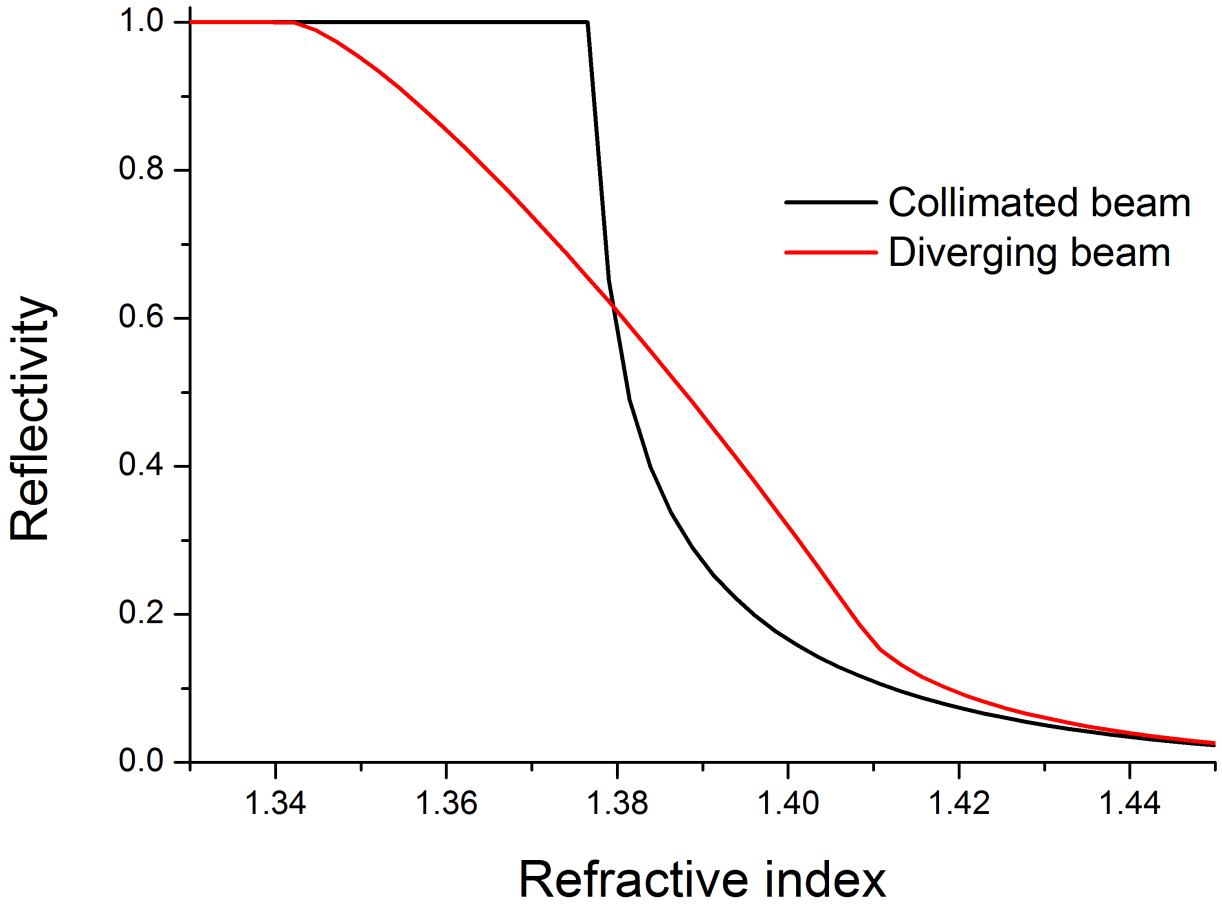

Figure S3. Calculated averaged reflectivities of a device with fully collimated light beam (black line) and the device with a slightly diverging one (red line) both at a center incident angle of 65◦. The device with a diverging beam shows an enlarged working range and a linearized response.

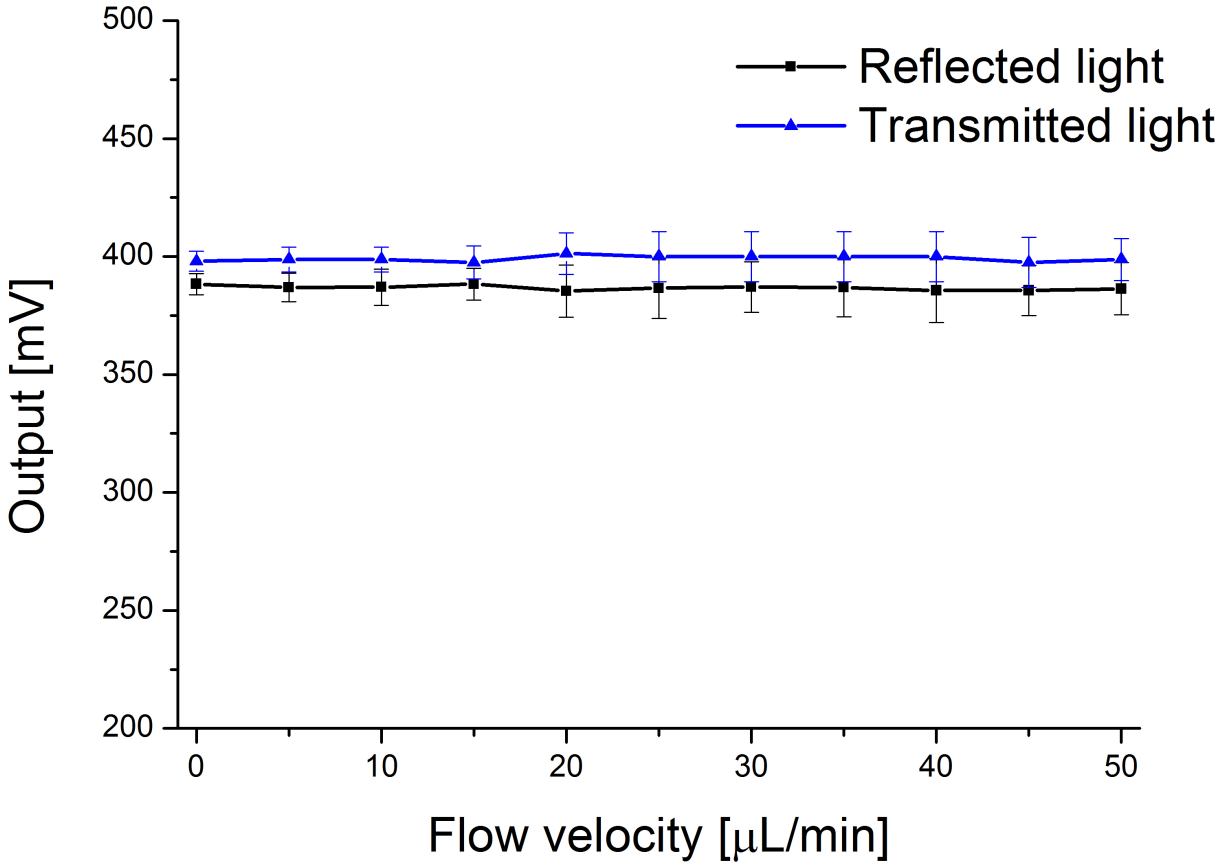

Figure S4. Reflected and transmitted light signals recorded at the two outputs for a single analyte. The results are not influenced by the flow rate at all.

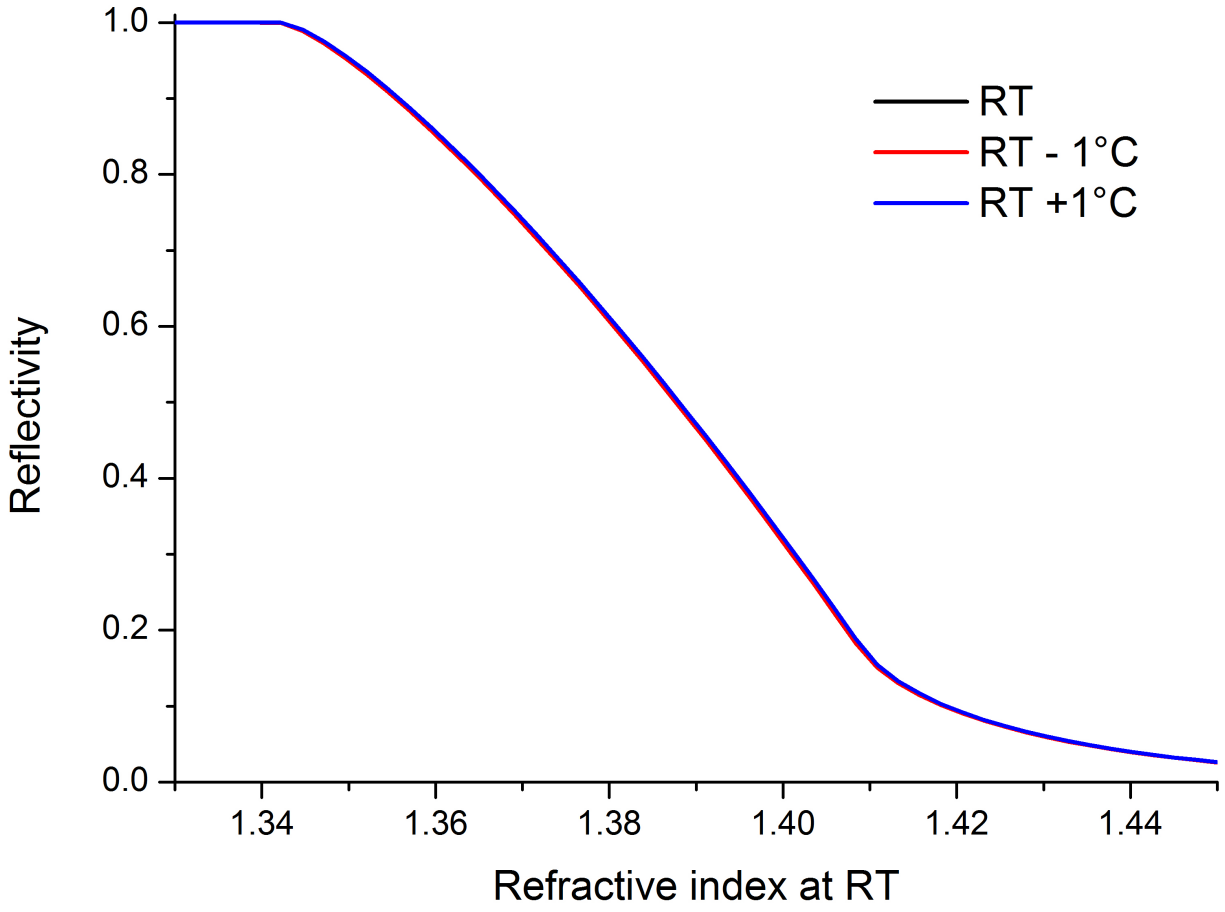

Figure S5. Influence of temperature variations of ± 1°C around room temperature (RT, 22°C). In a worst case scenario (thermo-optic coefficient, |dn/dT|, of both, sample solution and chip material, set to $1*10^{-4}$ K^{-1}) the maximum deviation from the RT line was below ± 1.7% (equivalent to a measurement error of approx. ±8 mmol/L for the $CaCl_2$ experiment) all over the investigated refractive index range.

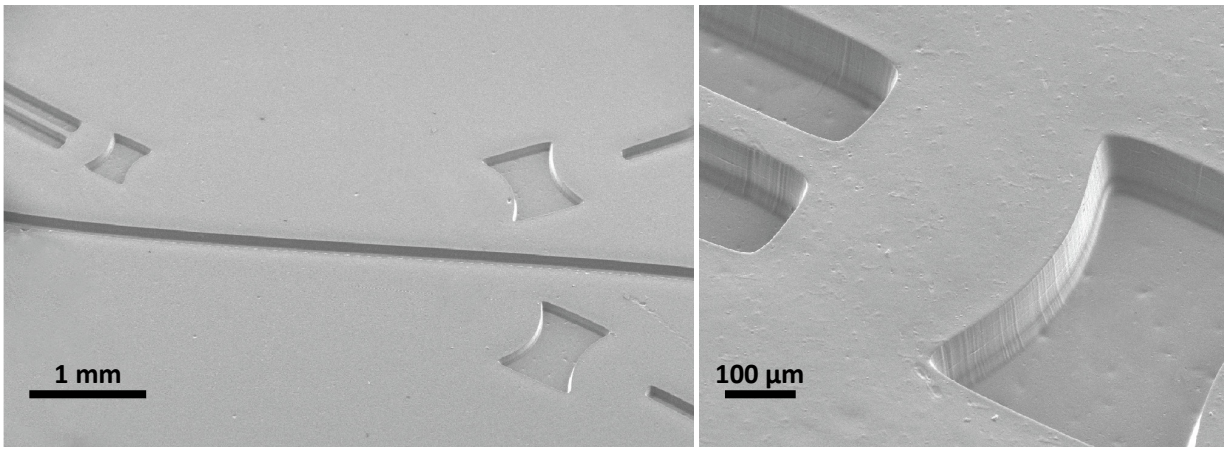

Figure S6. Scanning electron microscope images of fabricated devices. Left image shows the complete optical interrogation region including the integrated waveguide and the three air micro-lenses. Right image depicts a detail of the incident light lens.

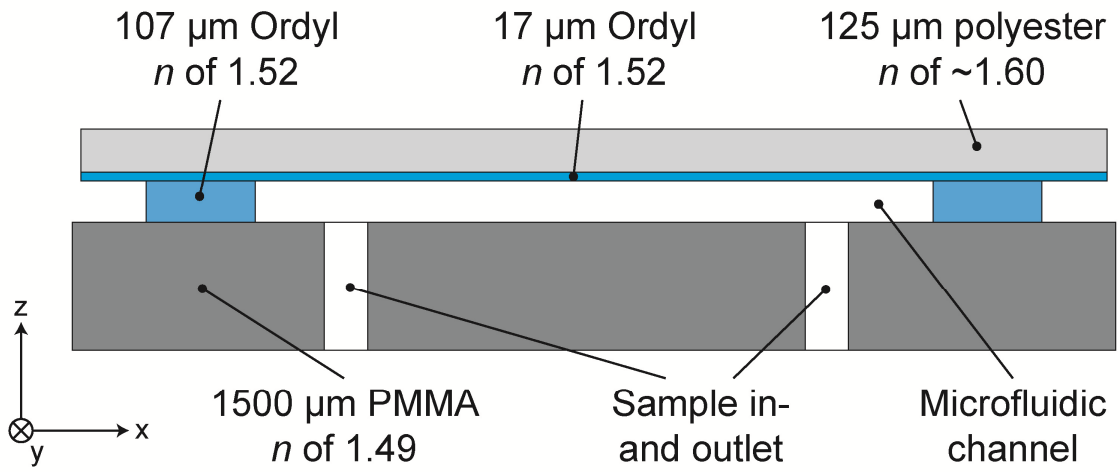

Figure S7. Cross-section of used chip assembly. Microfluidic and optical elements are structured in a 107 µm thick layer of dry resist (Ordyl). 17 µm dry resist on polyester foil and a PMMA microscope slide are used as top and bottom sealing, respectively.