Electronic Supplementary Material (ESI) for Lab on a Chip

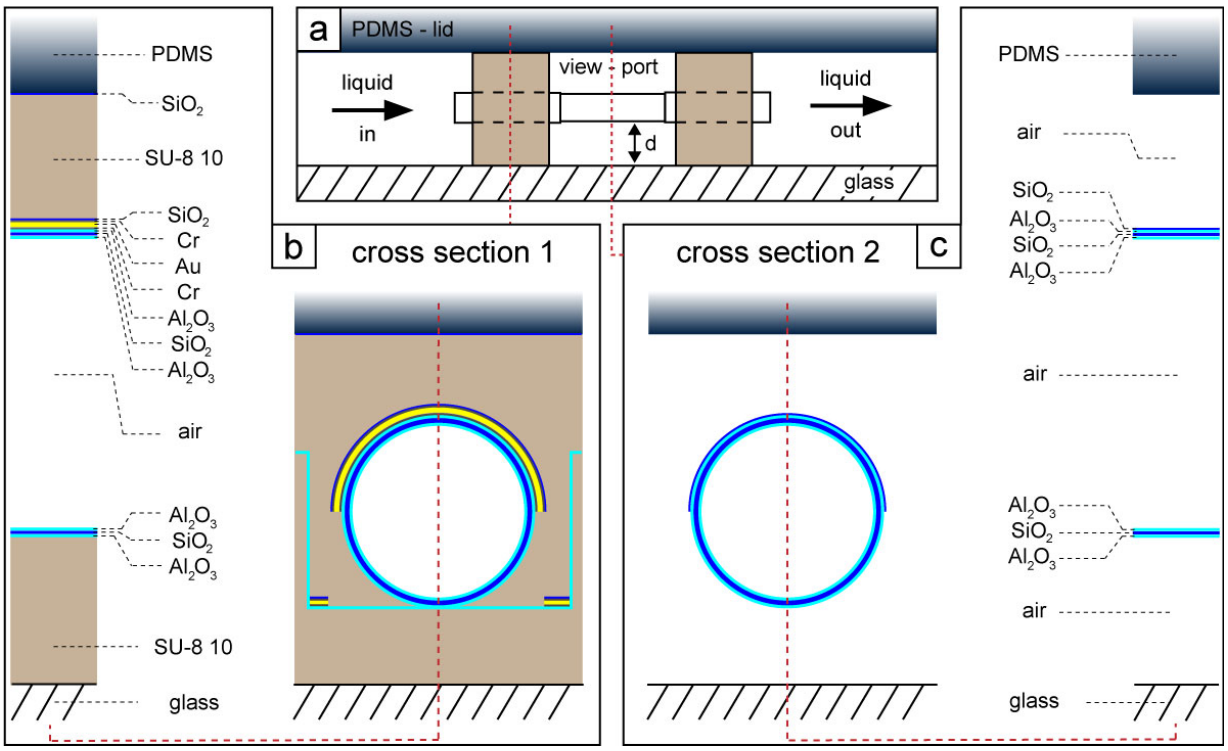
Lab-in-a-Tube: on-chip integration of glass optofluidic ring resonators for label-free sensing applications

Stefan M. Harazim,* Vladimir A. Bolaños Quiñones, Suwit Kiravittaya, Samuel Sanchez* and Oliver G. Schmidt

Institute for Integrative Nanosciences, IFW Dresden, Helmholtzstrasse 20, D-01069 Dresden, Germany

* Corresponding author, s.harazim@ifw-dresden.de and s.sanchez@ifw-dresden.de

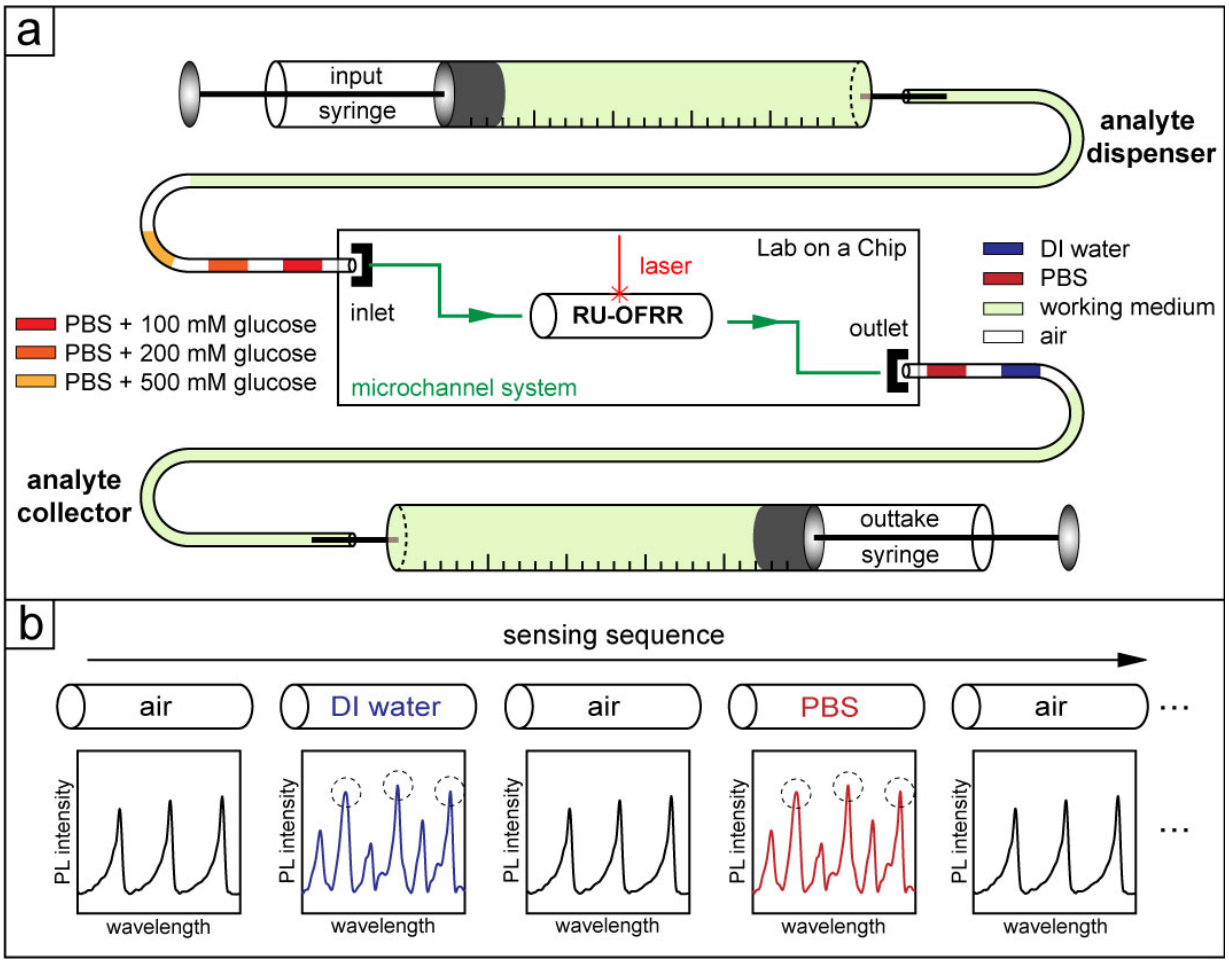
Supporting Information:



Supporting Figure 1: Schematic overview and cross sections of the sensor structure. (a) The microfluidic system containing the integrated RU-OFRRs is sandwiched between the glass substrate and the PDMS layer. (b) Cross section 1 displays all materials employed for the fabrication of the chip and shows the sealing of the microtube by a polymer matrix (SU-8 10). (c) Cross section 2 shows the RU-OFRR (blue ring) free-standing in the center of the microfluidic device.

The fluid can be pumped through the microtube by positive pressure at the inlet (liquid in) or negative pressure at the outlet (liquid out) as depicted in Supporting Figure 1.a. The distance d between the microtube and the substrate is set by the height of the sockets to 5 µm in order to reduce leakage of light from the microtube to the substrate.

Figure S1.b. shows a detailed insight into the layered structure of the microfluidic device. The SU-8 layer (brown color) encloses the microtube (SiO_2≡blue and Al_2O_3≡bright blue ring) and seals it completely. The UV-light protector cap consists of Au (yellow), whereas the Cr and SiO_2 materials are the interlayer adhesion agents between the material of the microtube and the SU-8 from the microchannel structure. Another SiO_2 layer is deposited on top of the upper SU-8 layer (microchannel structure) to enhance the adhesion between SU-8 and PDMS.[1] The second cross-section (Figure S1.c.) represents the center of the viewport (area with optical sensing properties) showing the free-standing character of the integrated RU-OFRRs.



Supporting Figure 2: Schematic of the fluidic setup with an example of a sensing sequence. (a) Analyte dispenser and collector are syringes connected to a syringe pump system. The tubing system is filled with different analytes separated by air. A microchannel system on the chip guides the analyte from the inlet trough the RU-OFRR to the outlet. (b) Example of a sensing sequence detected by PL spectroscopy. The quantitative determination of the liquid is done by monitoring the peak positions (wavelength) of the TM modes (dashed circles).

[1] J. C. McDonald and G. M. Whitesides, *Acc. Chem. Res.*, 2002, **35**, 491-499.