Design and characterization of polymer-based photonic integrated circuits operating in the visible region for environmental detection application
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Overview

Polymer-on-glass is a suitable platform to develop biochemical photonic sensors. In this work we present our advances on design and fabrication of optical sensor operating at $\lambda=505\text{nm}$. Enabling a tolerant and reliable fabrication process of these devices lays the groundwork for future low-cost biosensors.

Design

**Optical Microring Resonator (OMR)**

- **OMR Radius**
  - A round trip length below the coherence of the source
  - Free Spectral Range
  - Low bending losses

- **Coupling Area, Gap**
  - Critical coupling criterion
  - High Quality factor

- **Waveguide profile**
  - Monomodal conditions $@540\text{nm}$
  - Strong evanescent field in the sensing area

$\Rightarrow$ radius $=20\ \mu\text{m}$, gap $=250\text{nm}$, $w=350\text{nm}$, $h=350\text{nm}$

**Label-Free Optical Sensor**

**Microfluidic Cell**

Integrated Sensor

**Concept**

Challenges

- Miniaturization: Portable device
- Fast analysis
- Keep good selectivity and sensitivity
- Liquid environmental detection
- Low cost

**Fabrication**

**Thermal-UV NanoImprint Lithography (NIL)**

**Characterization set-up**

- Nano-waveguides of 350x350 nm have been designed and manufactured with polymer.
- Short period grating couplers (280-500 nm) were manufactured in the same fabrication step.
- Optical characterizations of the device are in progress.
- Active collaborations with Tecnalia, the LAAS and the ENS/LPQM (CNRS running project and ANR in submission) offer new application possibilities.

**References**
