Purpose and aim

The thesis is focused on research that can contribute to developing photonic crystal (PC) sensors for environmental monitoring. The thesis is motivated by the need to better understand the impact of human activities on the environment. PC sensors can be designed to be highly sensitive, selective, and capable of detecting low levels of different analytes, making them suitable for monitoring various environmental parameters. PCs offer high reflectivity and compactness due to their unique interference pathways. The goal is to contribute to better understand how these PCs can be integrated into robust optical sensing platforms, that can be adapted for different environmental sensing functions (etc. gas sensing) .

The main work in this thesis involves making laser-setup for interferometric measurements based on Fabry Perot interferometers, for testing of samples such as PCs and vibrating membranes. How different PC design affects the phase response, will also be investigated by simulation. Some other topics that will be covered in the thesis are; FSR, Allan Deviation, Relative Intensity Noise (RIN), minimum detectable change in cavity length (ΔL), noise equivalent displacement (NED).

Evaluating Photonic Crystal (PC) sensor for environmental monitoring

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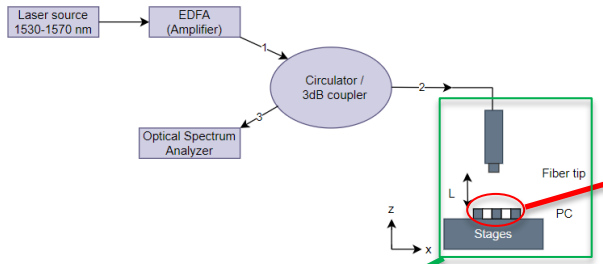
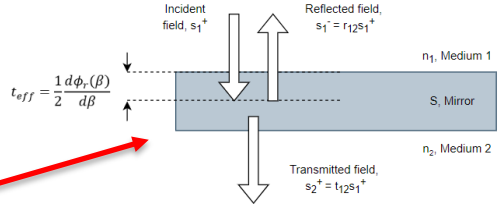
Overview

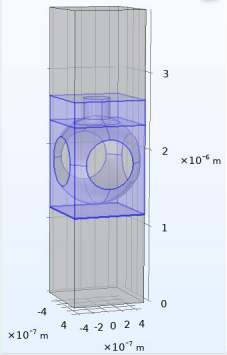
Setup to measure FSR and effective thickness



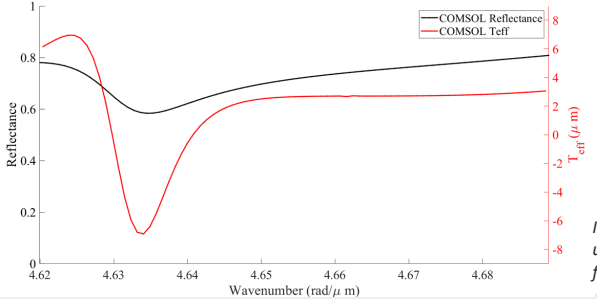
General illustration of effective thickness



PC design



Reflectance and effective thickness of PC



Application

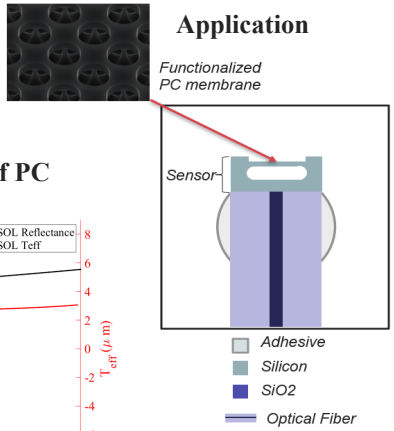


Illustration of how the sensors would be used for a PC that can be functionalized for different sensing functions.

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Anna Miller @ Stanford University
Einar Halvorsen @ USN

Thesis in collaboration with Stanford University.

Stanford University

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