

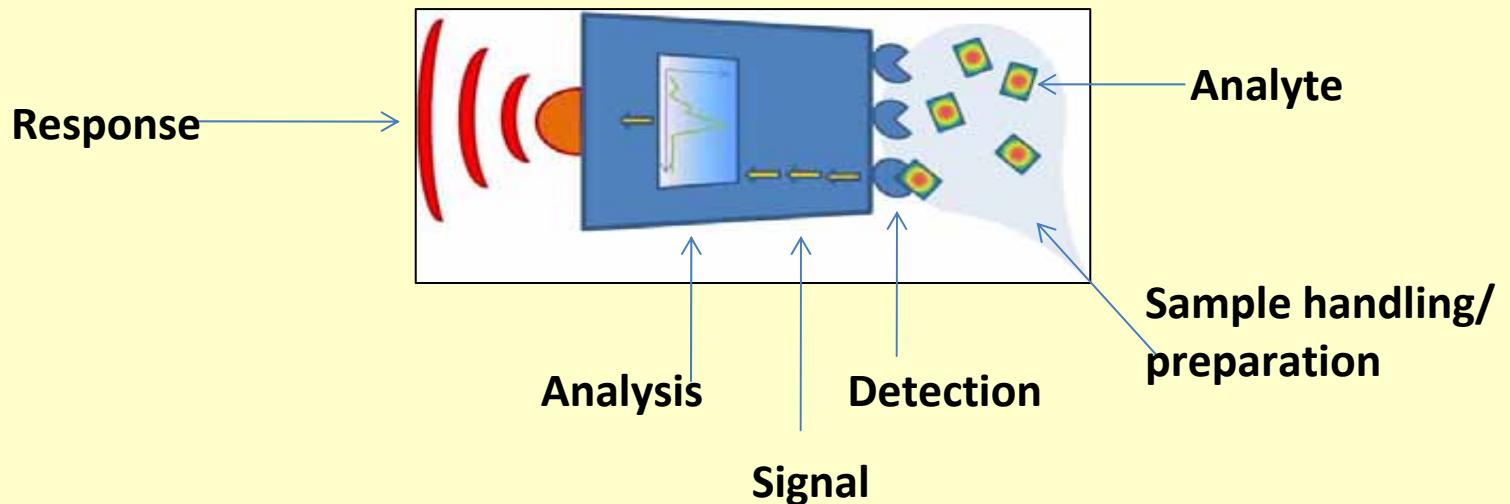
Filter based Optical Biosensor

Dr. Gajanan D. Nagare



Biosensor

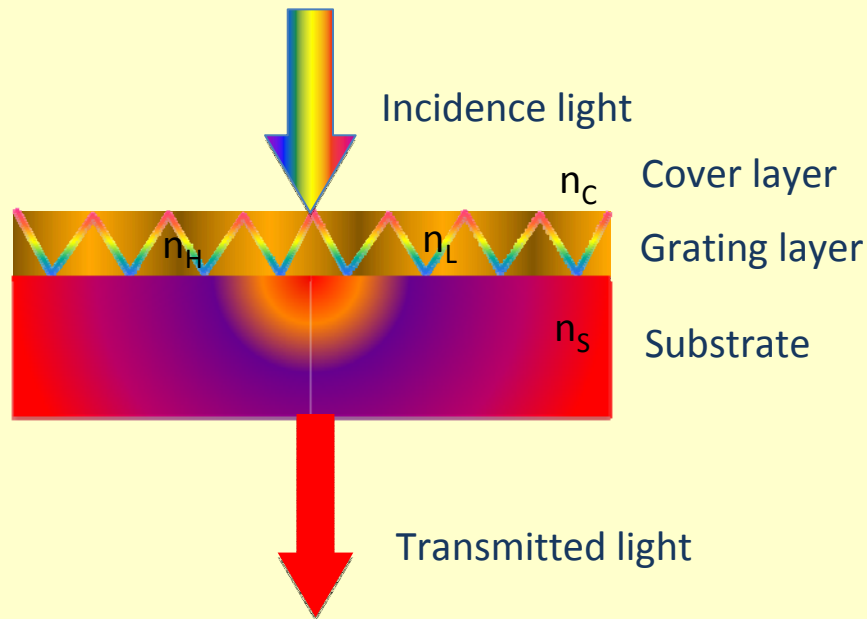
- Biosensor is a device that couples a biological sensing element to a transducer to generate a signal for a specific analyte



Typical issues & optical sensing

- Selectivity
- Sensitivity
- Reusability
- Miniaturized device
- Easy Operation
- Real-Time application
- Fluorescence ($\Delta\lambda$)
- Waveguides and Optical Fibers (ΔI or $\Delta\theta$)
- Photonic crystal ($\Delta\lambda_{res}$)
- Mach-Zehnder interferometer (MZI) ($\Delta\phi$)
- Surface plasmon resonance ($\Delta\lambda_{res}$)

Photonic crystal



Photonic crystal (PC) is a periodic arrangement of high and low refractive index materials on an optically transparent substrate

Specialty of the structure

Grating layer acts as a waveguide layer, if it satisfies the resonance criteria

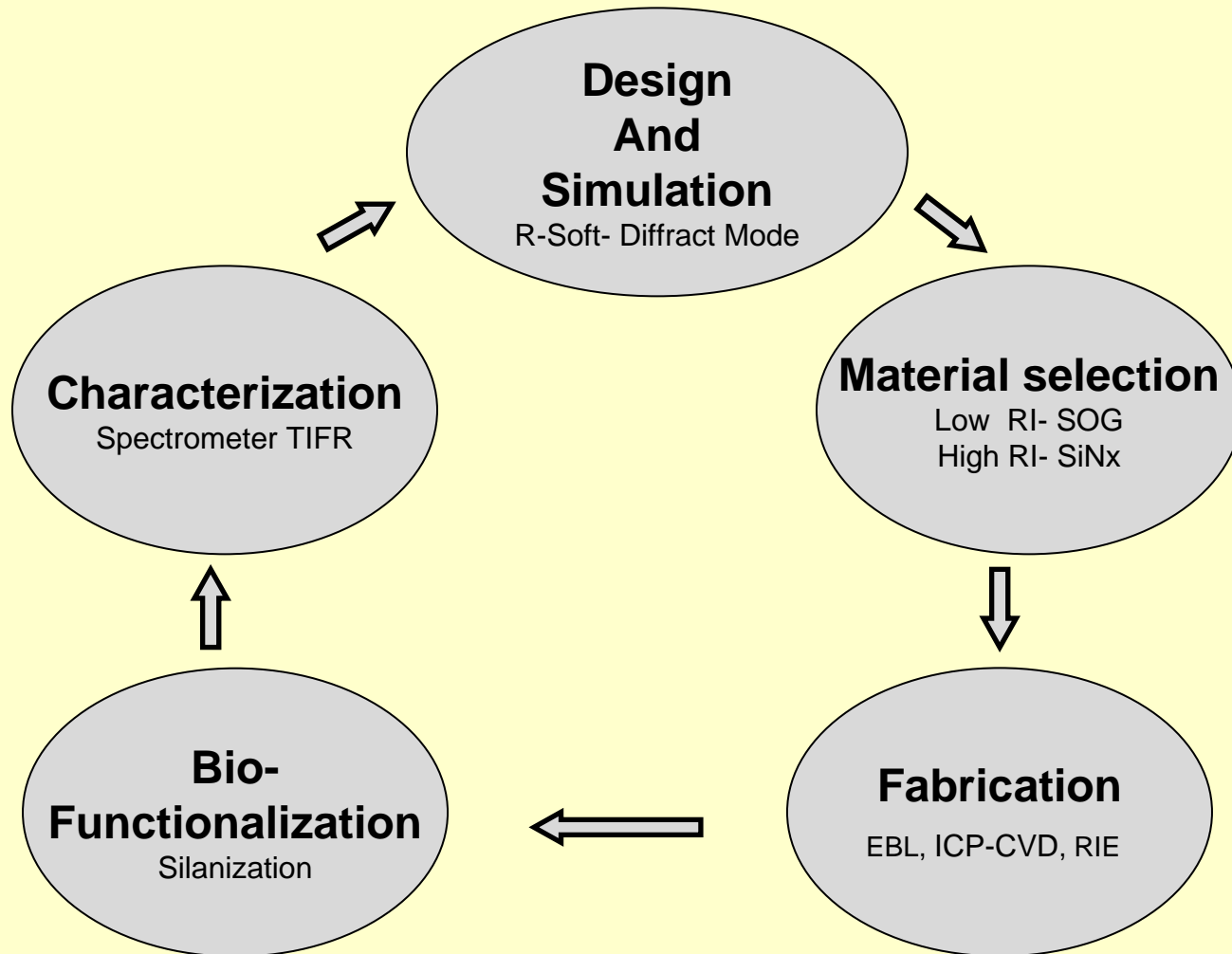
Resonance criteria

- $n_H > n_L$; $\text{Avg}(n_H, n_L) > n_c$ & n_s

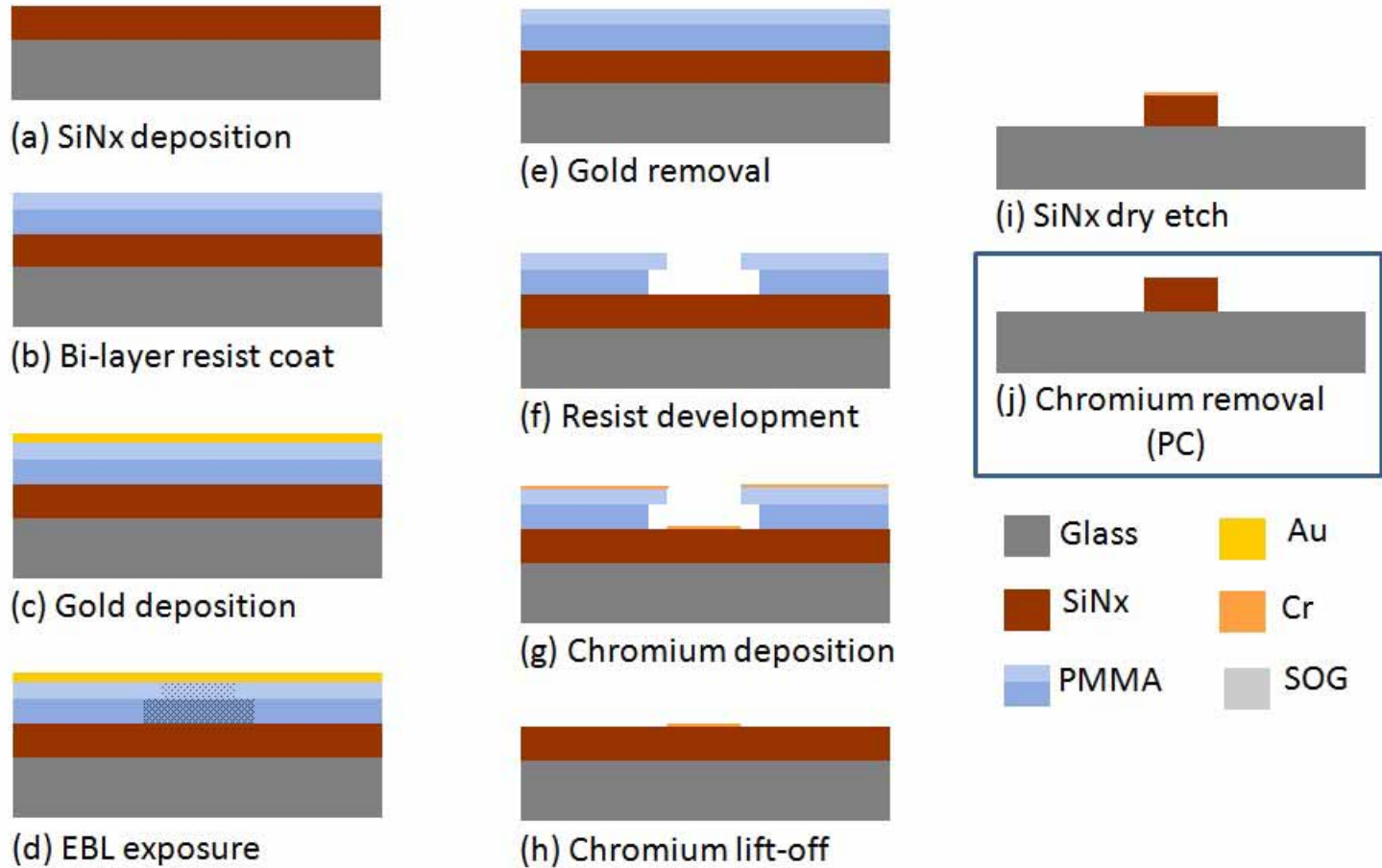
Working principle

Incident light couples by the grating layer and propagates through the waveguide layer and forms an interference pattern with the incident light. At a particular wavelength, the photonic crystal forms constructive interference and rejects the other part of the spectrum.

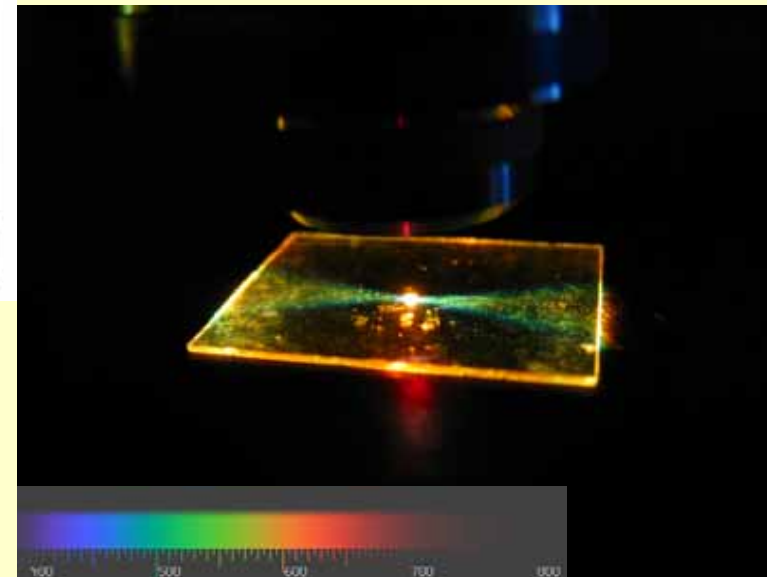
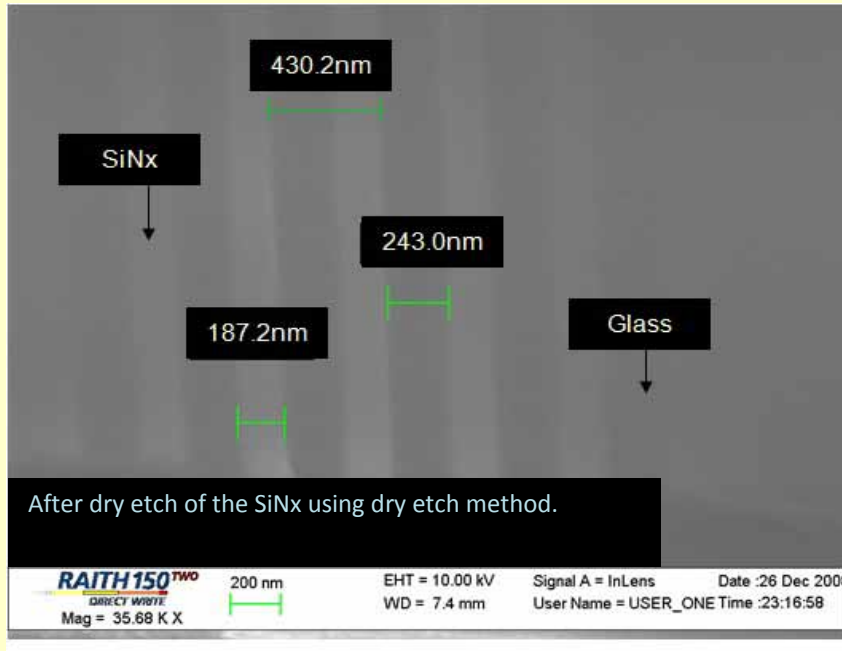
Phases for the development of biosensor



Fabrication of Single layer 2-D photonic crystal



Fabricated Photonic crystal



Acknowledgement





Thank YOU!!!