MicroVacuum presents

Integrated Optical Chemical and Biochemical Sensors

http://www.microvacuum.com/products/biosensor/

Optical Waveguide Lightmode Spectroscopy (OWLS)

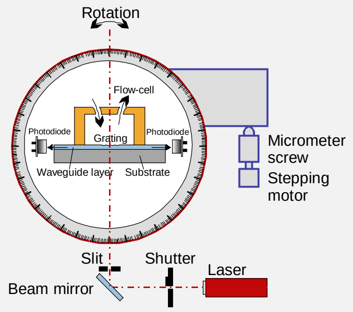
INTRODUCTION

The basic principle of the OWLS method is that linearly polarized light (He-Ne laser) is coupled by a diffraction grating into the waveguide layer, provided that the incoupling condition is fulfilled.

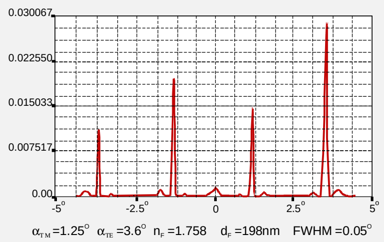
The incoupling is a resonance phenomenon, that occurs at a precise angle of incidence which depends on the refractive index of the medium covering the surface of the waveguide. In the waveguide layer the light is guided by total internal reflection to the ends where it is detected by photodiodes. By varying the angle of incidence of the light the mode spectrum can be obtained from which the effective refractive indices are calculated for both the electric and magnetic modes.

OWLS is a label free technique for investigating adsorption, binding and adhesion processes.

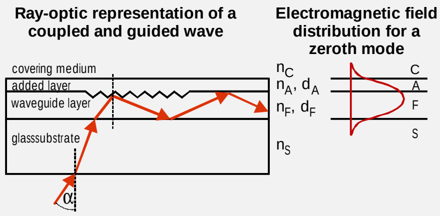
OWLS INSTRUMENT SCHEMATIC DRAWING



MEASURED SPECTRA



THEORY AND MODELS



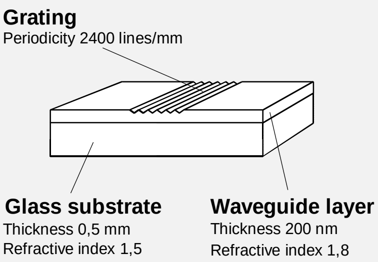
Calculation

- The incoupling angles α(TE), α(TM) for electric and magnetic modes are evaluated from the measured spectra
- The effective refractive indices N(TE), N(TM) of the waveguide structure are calculated on the basis of incoupling condition.
- Supposing that N(TE), N(TM) has been calculated and the optical parameters of the waveguide layer (n_F,d_F), of the substrate (n_S), of the covering medium (n_C) are known, the refractive index (n_A) and the thickness (d_A) of the added layer can be calculated.
- Using the model that the refractive index in the adsorbed layer linearly depends on the concentration of the adsorbed material, the mass per area of the adsorbed material can be calculated.

OW 2400

OPTICAL GRATING COUPLER SENSOR CHIPS

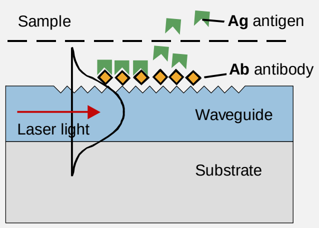
Sensor chips made by SOL-GEL technology are produced at MicroVacuum Ltd.



Sensing Principles

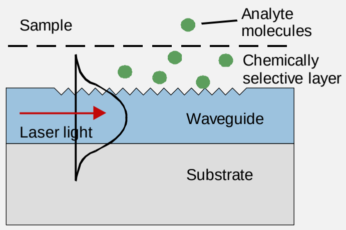
IMMUNOSENSOR

Monomolecular chemoresponsive coating, which consists of immobilized antigen (Ag) molecules, that bind the corresponding antibody (Ab) molecules.



CHEMOSENSOR

With a typically 0,1-1 µm thick chemoresponsive layer whose refractive index is changed by binding the analyte molecules.



Applications

- Adsorption of proteins at surfaces
- Ligand/receptor binding (antibody/antigen)
- Immunosensing
- Drug screening
- Protein - lipid bilayer interactions
- Protein - DNA interactions
- Molecular self-assembly & nanoscience
- Analysis of association and dissociation kinetics
- Kinetics of adhesion, growth and spreading of animal cells
- Humidity and gas monitoring

Publications

- J.J.Ramsden -Journal of Molecular Recognition, Vol.10. 109-120 (1997)
- W.Lukosz -Sensors and Actuators B29 37-50 (1995)
- J.J.Ramsden et. al. -Fizikai Szemle Vol.9. 281-285 (1997)
- K.Tiefenthaler -Advances in Biosensors, Vol.2. 261-289(1992) JAI Press Ltd.

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