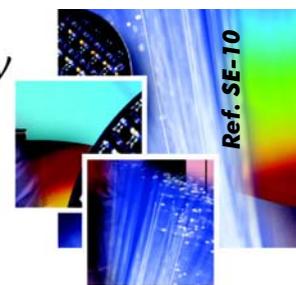


Spectroscopic Ellipsometric Measurements on Biochip Structures in a Liquid Flow Cell Environment



Ref. SE-10


UVISEL

Michel Stchakovsky - Application Scientist - Thin Film Division

The samples described here were DNA 35 base fragments thiol-grafted deposited on a thick gold layer. Although this experiment can be performed in air it is important to study such samples in a biosensor configuration, where the desired interaction between the grafted DNA and different analyte solutions can be characterised. The performance of the UVISEL Spectroscopic Phase Modulated Ellipsometer allows very sensitive and selective study of the kinetics and quantification of such interactions.

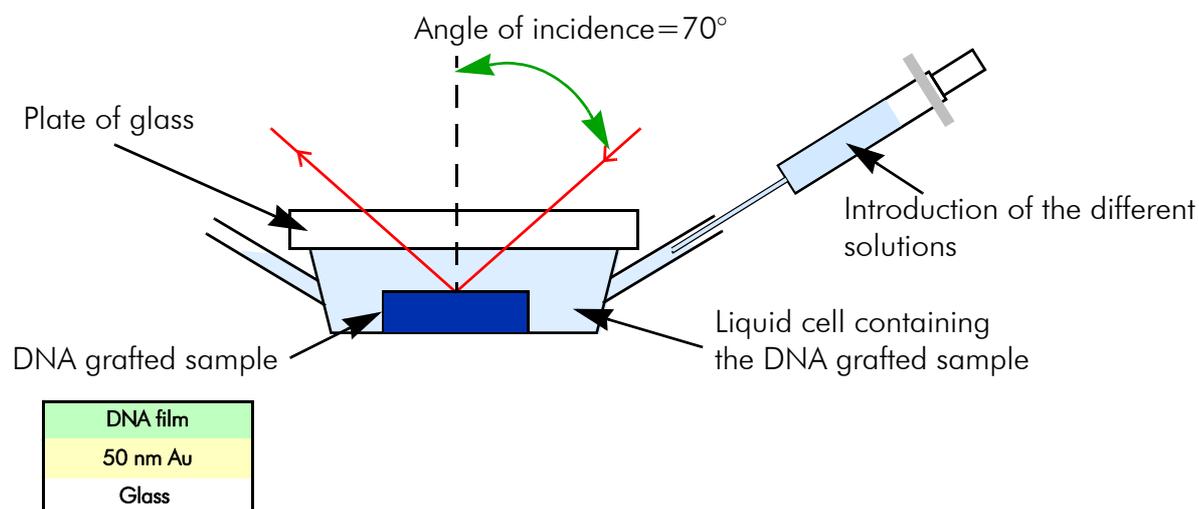
Characterization of the DNA grafted sample

The measurements described in this Application Note were performed using a liquid cell using a standard ellipsometric configuration. The ambient medium was air. A further note (AN-SE11) will describe these measurements using the alternative technique of Total Internal Reflection Ellipsometry (TIRE). The versatility of the standard UVISEL ellipsometer allows measurements to be made using either methodology.

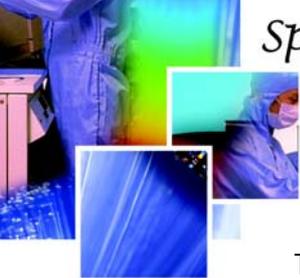
The objective of this experiment was to analyze the effect of a PBS buffer solution made up of phosphate ions and NaCl salt on the biological layer of ADN.

Initially, the cell was filled with deionized distilled water, then at a given time the buffer solution was introduced with constant flow.

The figure below represents the experimental configuration used.

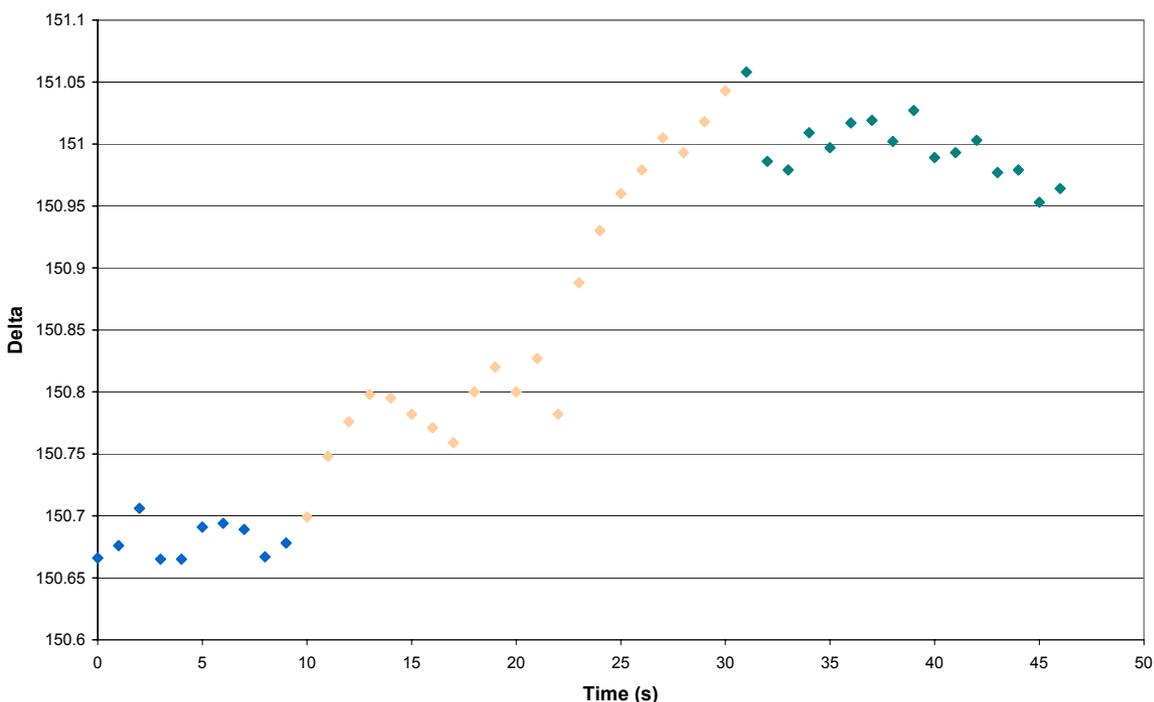

HORIBA GROUP

Spectroscopic Ellipsometry



During the experiment the ellipsometric angle Δ was recorded versus time at 496 nm. This wavelength was chosen as it provides the maximum intensity of the signal.

The next figure shows how the ellipsometric angle Δ changes during the spectrum can be detected.



- From $t=0$ to $t=10$ s: the DNA grafted sample was initially immersed into deionized distilled water. The spectrum exhibits a Δ angle around 150.7° .
- From $t=10$ to $t=30$ s: a PBS buffer solution (Phosphate + Sodium Chloride) was introduced into the cell over a 20 second period. The Δ value increases from 150.7° to 151° .
- After $t=30$ s the introduction of the PBS solution was stopped and the Δ angle tends to remain stable.

Conclusion

Interpretation of this behaviour is not fully understood, but it is likely to be due to the ionic interaction between the DNA and the buffer solution. A natural negative charge on the DNA fragments means that in a neutral environment, such as water, their preferred orientation would be for the molecules to lay on the gold layer with no preferred orientation. When the buffer solution is added there is an interaction with the positive ions in the solution, and the DNA fragments stand up leading to an increase in layer thickness.

The authors would like to thank Eric Finot from Bourgogne University for his support in this work.

This document is not contractually binding under any circumstances - Printed in France - 08/2004

France:

Jobin Yvon S.A.S.
Z.A. De la Vigne aux Loups
5, Avenue Arago
91380 Chilly Mazarin
Tel: +33 (0) 1 64 54 13 00
Fax: +33 (0) 1 69 74 88 61
Email: tfd-sales@jobinyvon.fr

USA:

Jobin Yvon Inc.
3880 Park Avenue
Edison, NJ 08820-3012
Toll-Free: **1-866-jobinyvon**
Tel: +1-732-494-8660
Fax: +1-732-549-5125
Email: info@jobinyvon.com

JY Germany: +49 (0) 89 4623 17-0

JY Italy: +39 0 2 5760 3050

JY Japan: +81 (0) 3 3861 8231

JY UK: +44 (0) 20 8204 8142

JY China: +86 (0) 10 6849 2216

JY Korea: +82 2 576 8650



Explore the future

HORIBA GROUP

EMISSION • FLUORESCENCE • FORENSICS • GRATINGS & OEM • OPTICAL SPECTROSCOPY • RAMAN • THIN FILM