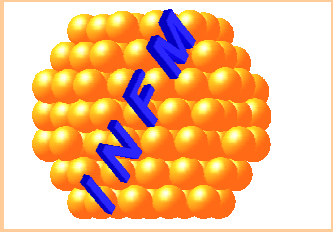

Caracterizarea suprafetelor nanostructurate de aur prin observarea alinierii moleculelor de cristale lichide

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Florin Cotorobai, Stefan Frunza

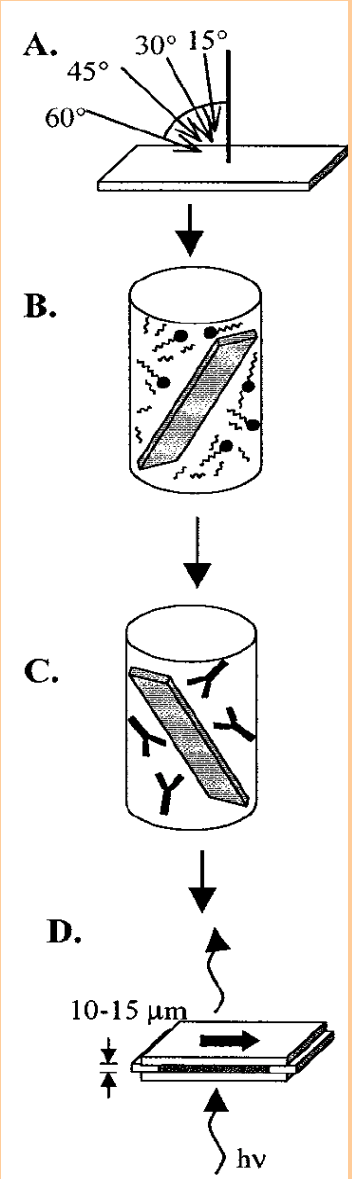
Institutul National de Cercetare Dezvoltare pentru Fizica Materialelor

Corneliu N. Zaharia

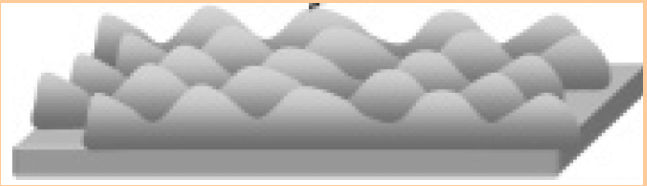
Institutul de Virusologie Stefan S. Nicolau al Academiei Romane

Seminarul National de Nanostiinta si Nanotehnologie, 16 martie 2010

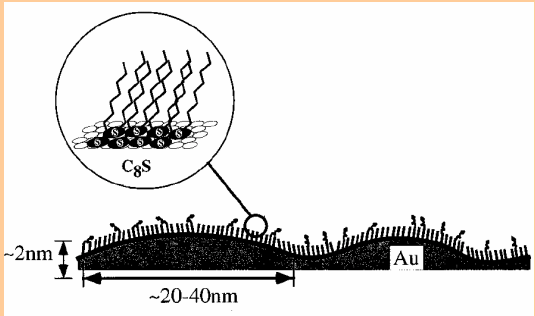
Motivare



Depunerea unor straturi subtiri nanostructurate de aur

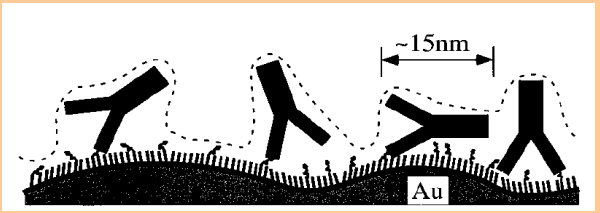


Functionalizare prin formarea de straturi autoasamblate (SAM) de tioli (CnSH si BiSH).



Legarea anti-Bi IgG

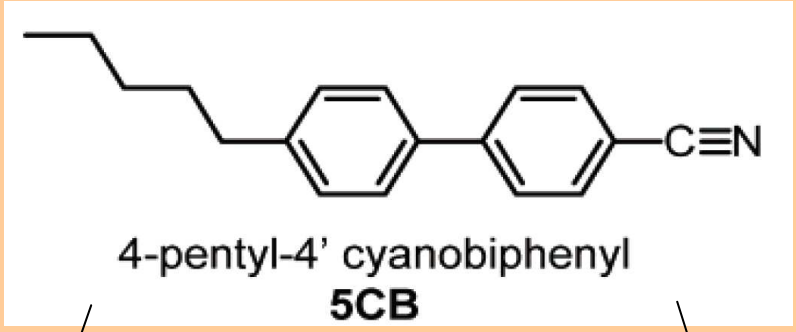
(15 x 10 x 5 nm)

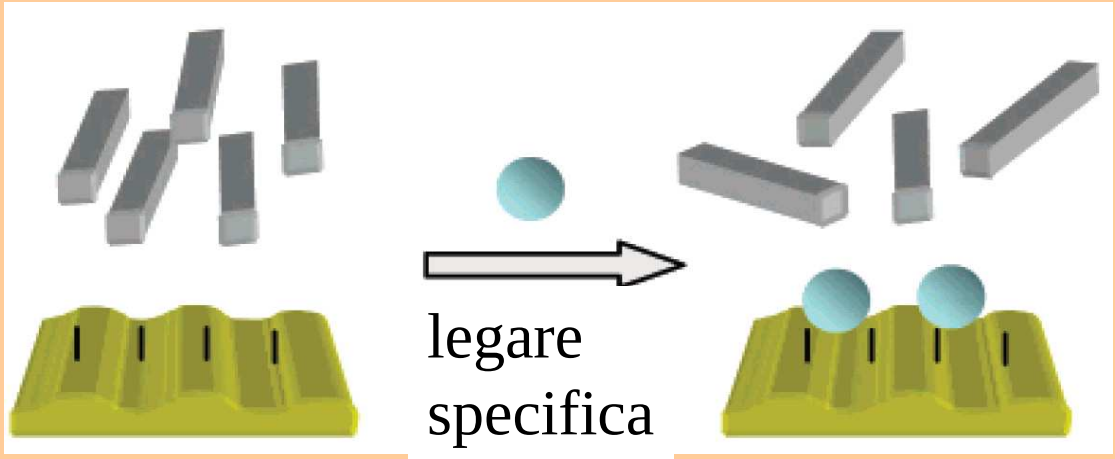


Inspectia optica a cristalului lichid aflat intre doua straturi SAM care suporta IgG legata.

N.L. Abbott's Group /Langmuir 2001, 17, 5448-5457; 5595-5604

Cristalul lichid





Cristalul lichid nematic 5CB este folosit pentru a depista existenta unor biomolecule la interfete:
legarea proteinei modifica ordonarea moleculelor in apropierea suprafetei

Experimental

A

Placuta de sticla

Aur la incidenta oblica
Stabilire conditii
Caracterizare

Celule cu cristal lichid

B

Placuta de sticla

Polistiren

Aur la incidenta oblica

Functionalizare

Caracterizare

Celule cu cristal lichid

Experimental

Materiale

Placute de sticla (32x23x3 mm)
Polistiren
Aur
Alcantiol (C16SH)
Cristal lichid 5CB

Metode de depunere

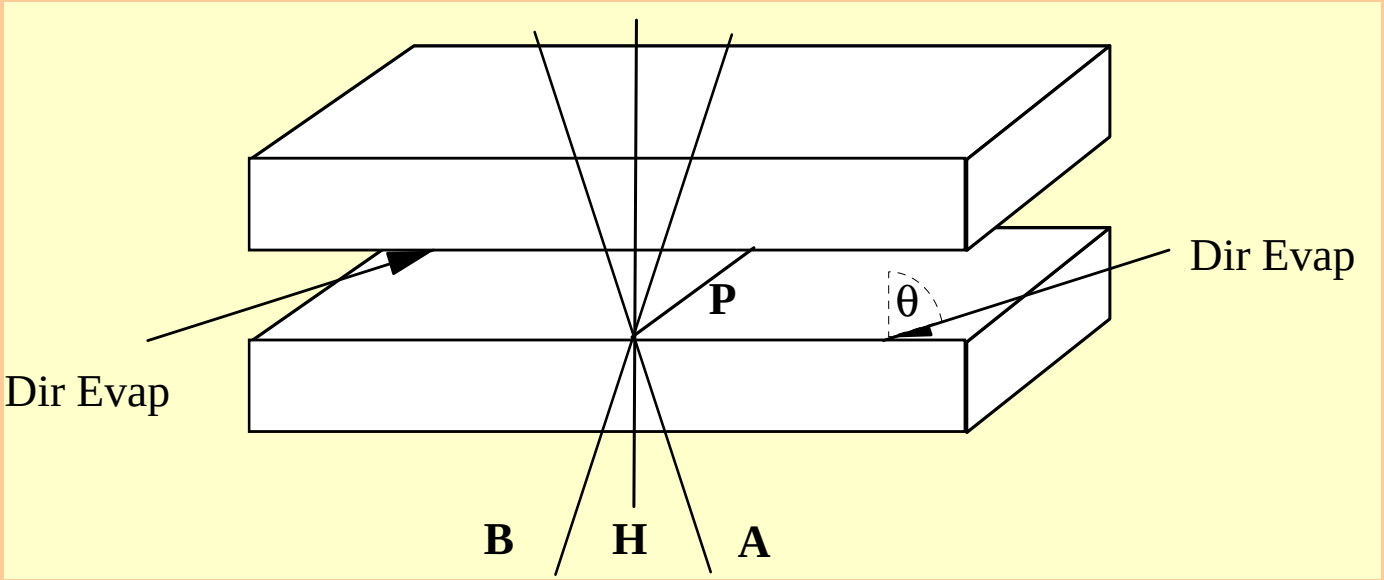
Spin coating
Depunere in vacuum la unghi de incidenta mic

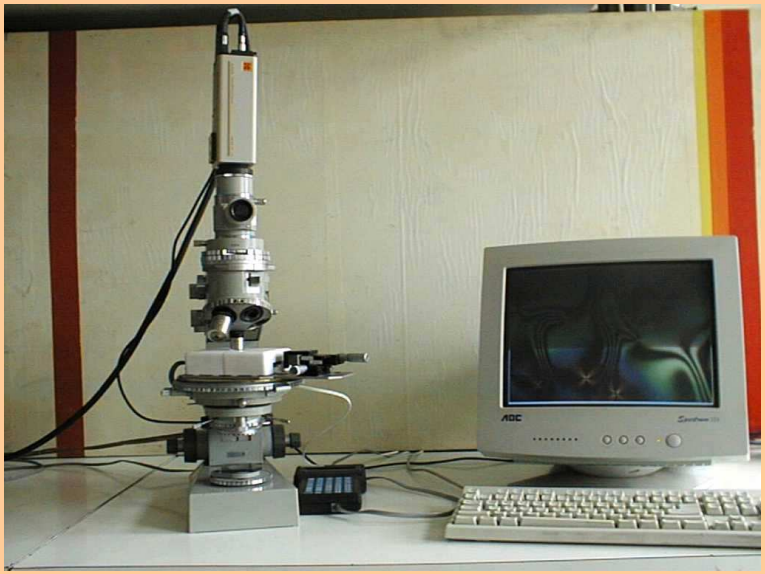
Metode de caracterizare

AFM
Park XE-150 (Schaefer)
XPS
VG ESCA MkII
XRD la unghi razant
Advance D8 (Bruker)
Spectroelipsometrie
DUV-VIS-XNIR Variable Angle
Spectroscopie Raman
RFS 100/S (Bruker)

FTIR
SPECTRUM BX (Perkin Elmer)
UV-VIS
Lambda 45 (Perkin Elmer)
Unghi de contact
DSA 100 (Kruess)
Microscopie optica
microscope in lumina polarizata
masuta incalzitoare
camera video

Experimental





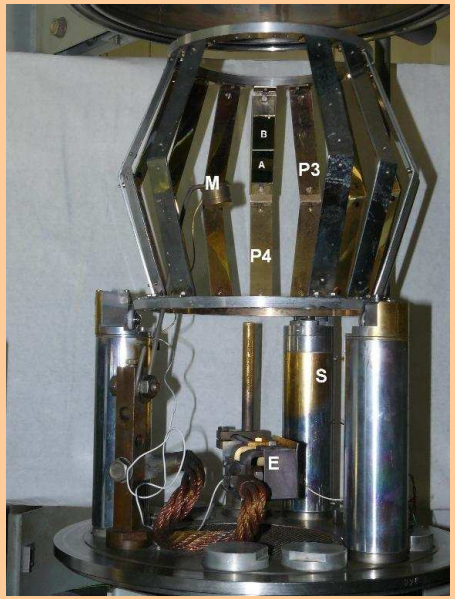
Fascicul paralel → **Uniformitatea alinierii**

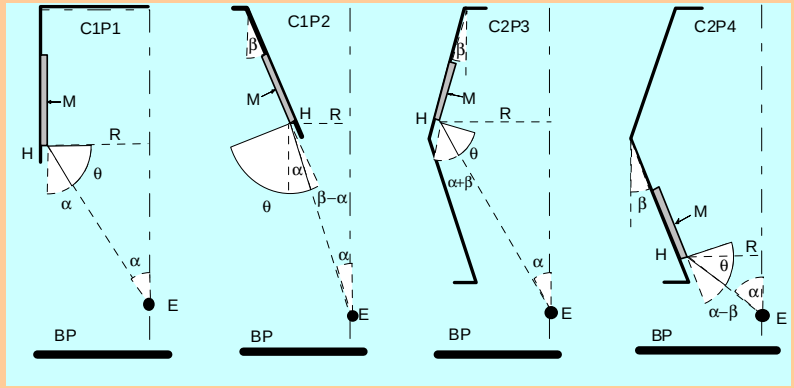
Fascicul convergent → **Texturi inclinate A-H-B**

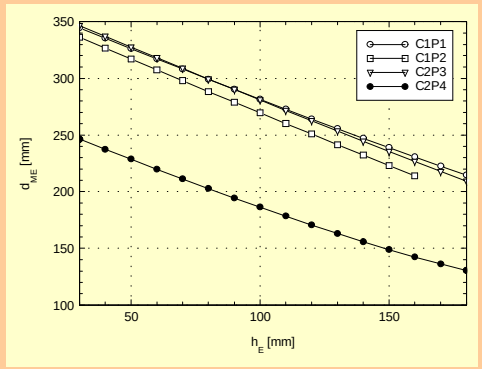
Aliniere tangentiala → **In planul evaporarii**
Perpendicular pe plan

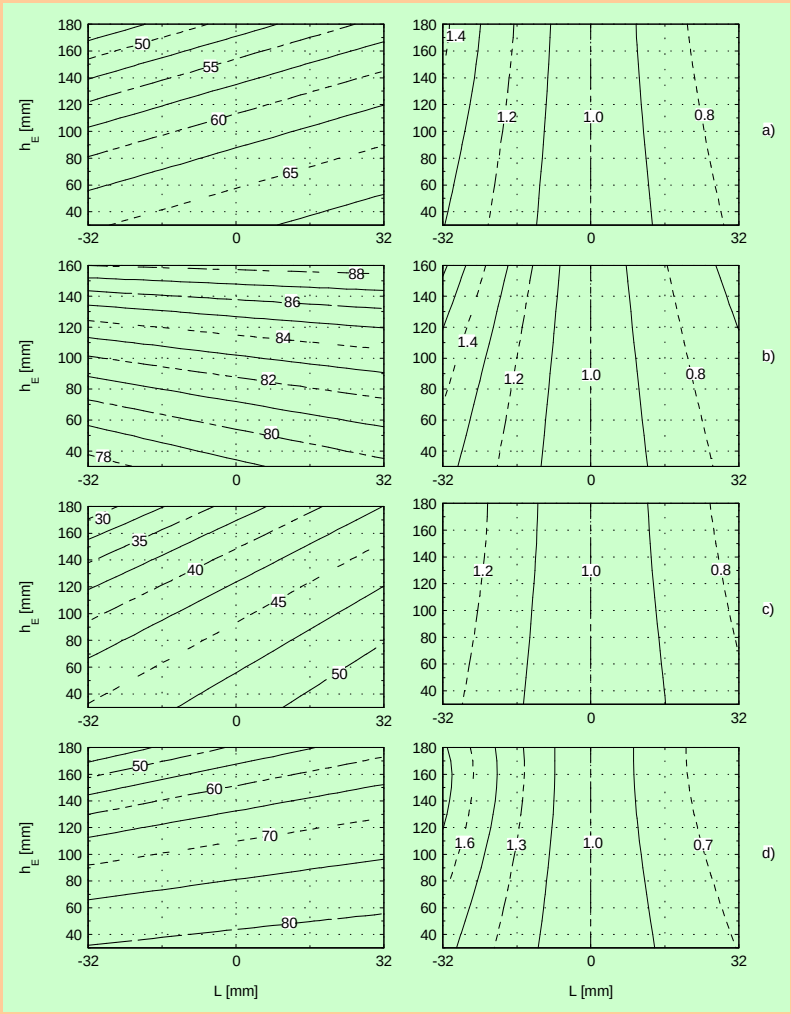
Aliniere homeotropa

REZULTATE A



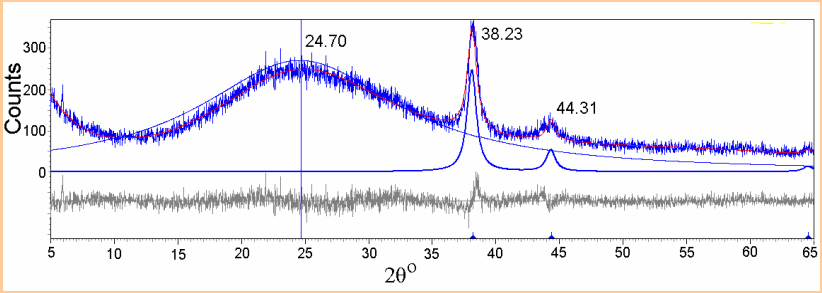


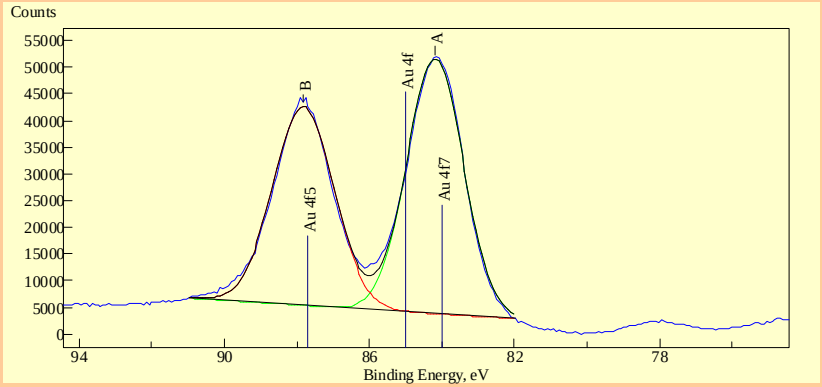


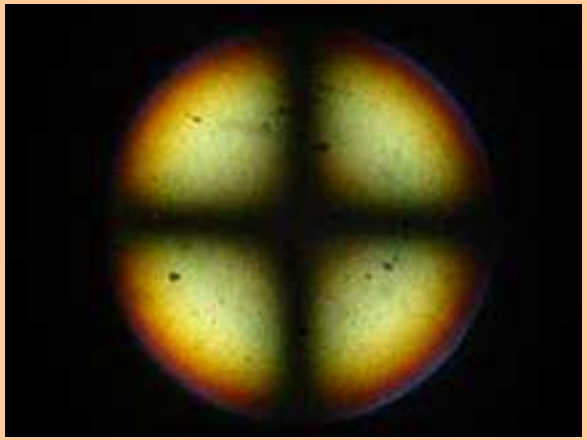


T. Beica, S. Frunza, I. Zgura s.a., JOAM, 12, 347-353, 2010

REZULTATE A

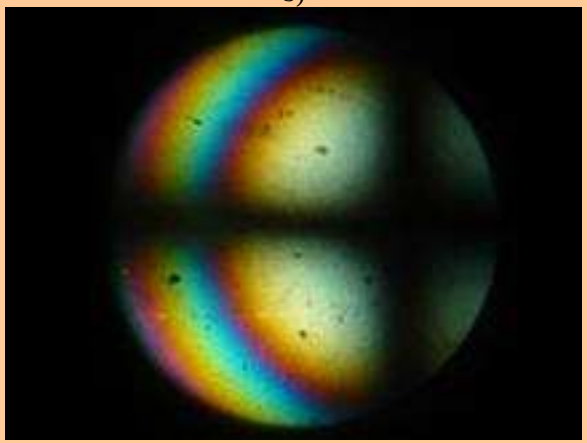






a)

b)



c)

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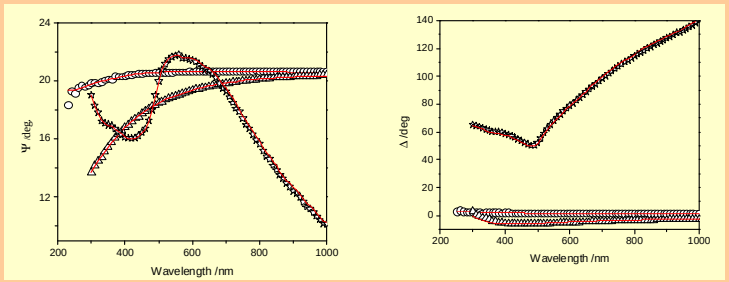
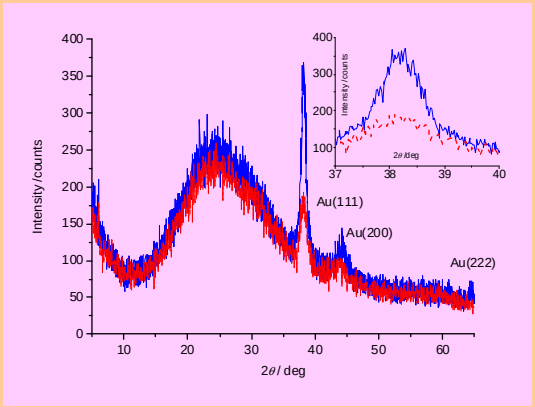
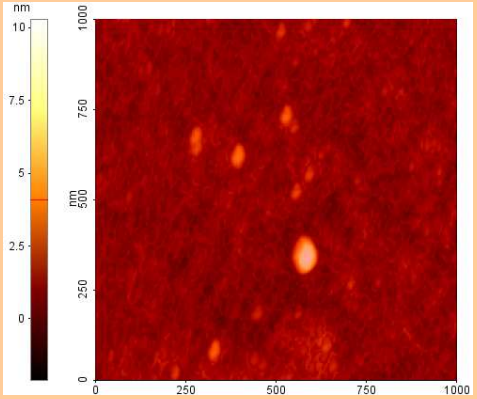
REZULTATE B

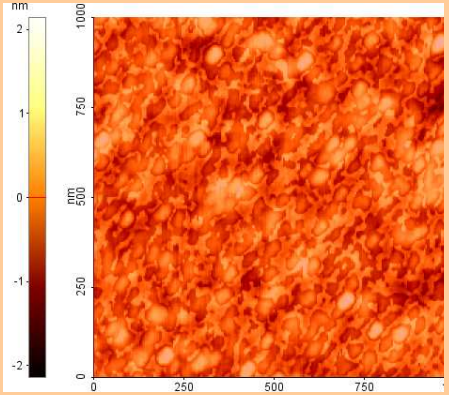


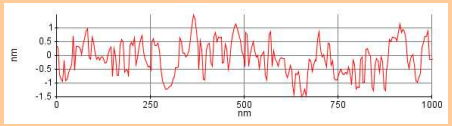


Rietveld analysis : Crystallites of 11.5 nm

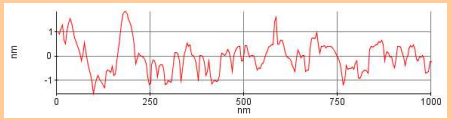
I. Zgura, T. Beica, S. Frunza s.a., JOAM, 12, 354-359, 2010



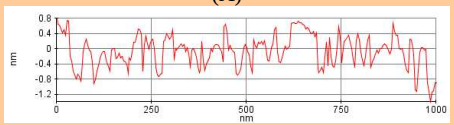




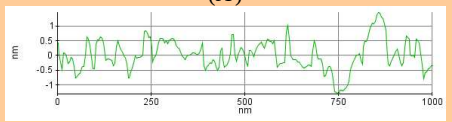
(A)



(A')



(B)



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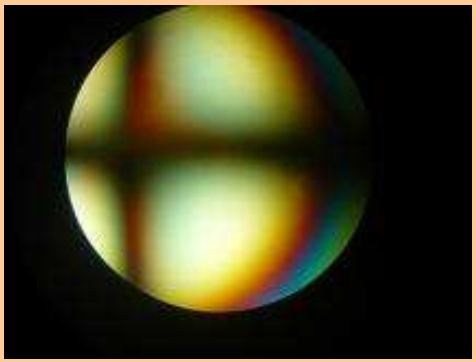
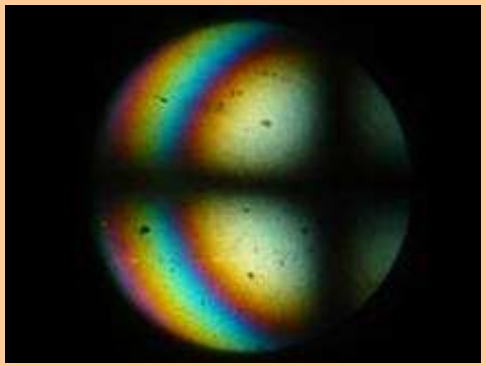
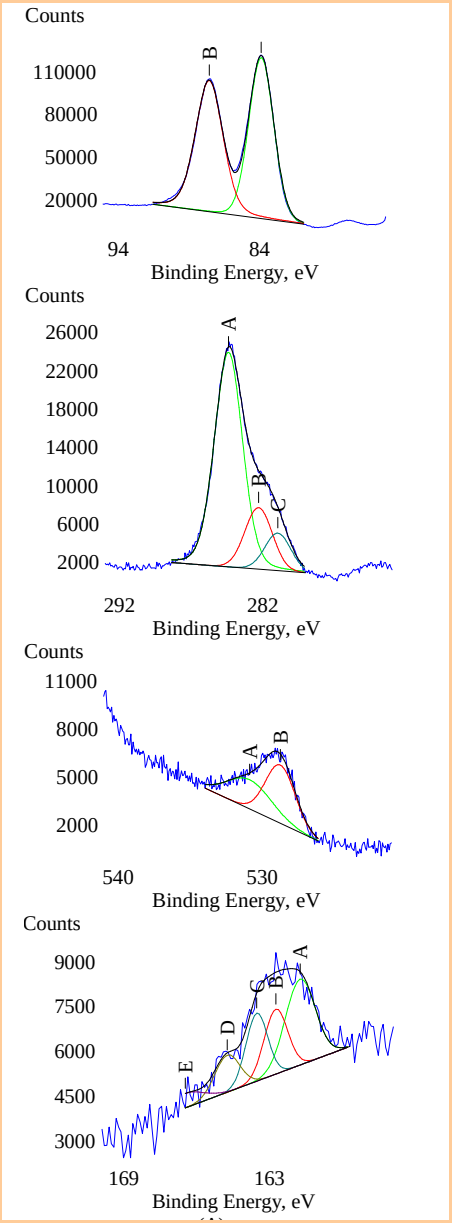


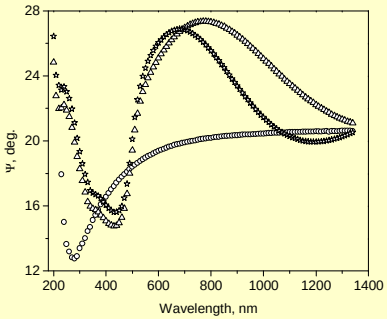
(A)

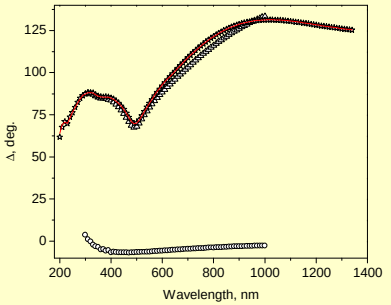


(B)

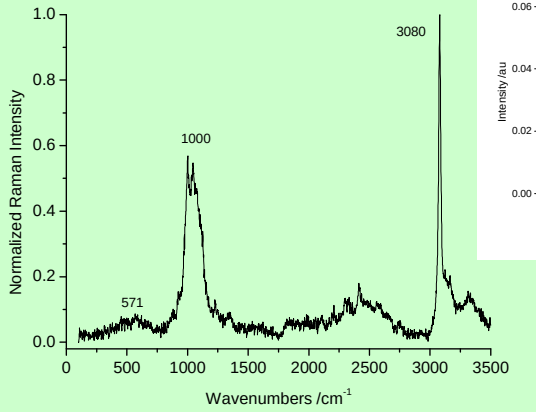
REZULTATE B

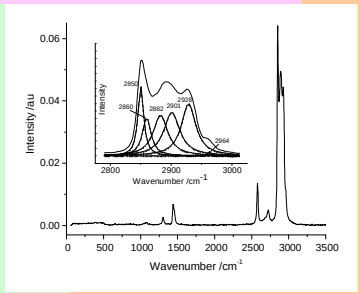






Layer\Sample	*C16SH*-P(3)	*C16SH*-P(4)
Polystyrene	51.3	51.0
Gold	7.3	9.1
SAM	0.8	1.2





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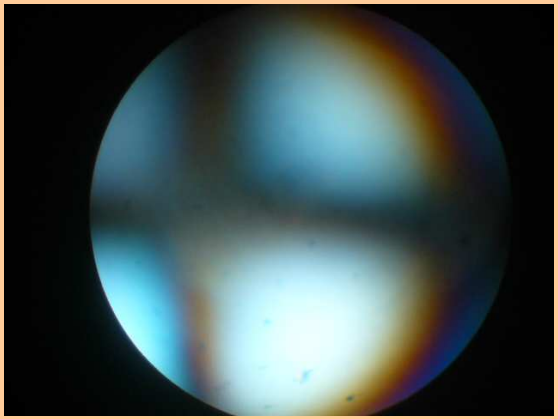
REZULTATE B

(a)

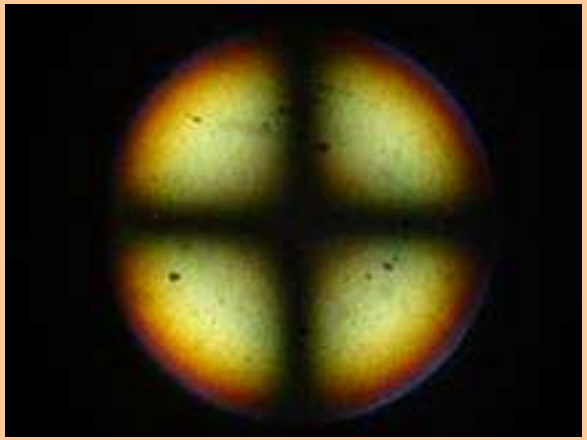


(b)

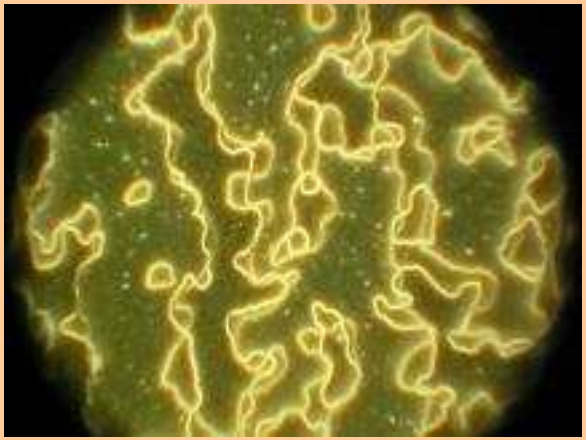
Substrat sticla

St: Au
($\theta=80^0, h_{Au}=120Å$)

Dr: SAM/Au
($\theta=80^0, h_{Au}=120Å$)



(a)



(b)

Substrat polistiren

St: Au
($\theta=60^0, h_{Au}=200Å$)

Dr: SAM/ Au
($\theta=60^0, h_{Au}=200Å$)

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Concluzii

Straturi de aur nanostructurate pot fi obtinute si pe substrat de polistiren, cu aderenta buna.

Metoda observarii alinierii moleculelor de cristal lichid poate fi aplicata ca un element de control pe tot parcursul depunerii de straturi.

In cazurile fara SAM, orientarea este in planul de incidenta al vaporilor de aur. Unghiul de inclinare depinde de unghiul de incidenta si de grosimea stratului. Orientarea este fie perfect homeotropa, fie inclinata, slab sau puternic.

Functionalizarea cu tiol modifica orientarea moleculelor in functie de grosimea stratului si unghiul de depunere

Multumiri

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O. Rasoga *Elipsometrie*
A. Galca

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M. Dinescu

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