ΜΙΚΡΟΣΚΟΠΙΚΗ ΚΑΙ ΦΑΣΜΑΤΟΣΚΟΠΙΚΗ ΔΙΕΡΕΥΝΗΣΗ

ΤΩΝ ΠΡΩΤΟΓΕΝΩΝ & ΔΕΥΤΕΡΟΓΕΝΩΝ ΟΡΥΚΤΩΝ ΣΥΣΤΑΤΙΚΩΝ

ΤΩΝ ΦΥΣΙΚΩΝ ΔΟΜΙΚΩΝ ΛΙΘΩΝ

ΑΛΛΟΙΩΣΕΙΣ

ΤΩΝ ΜΑΡΜΑΡΩΝ

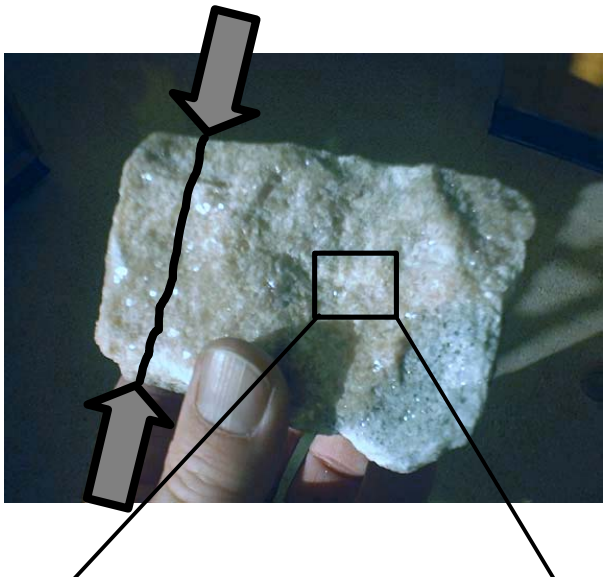
Μελέτη της επιφάνειας
των ανθρακικών ορυκτών

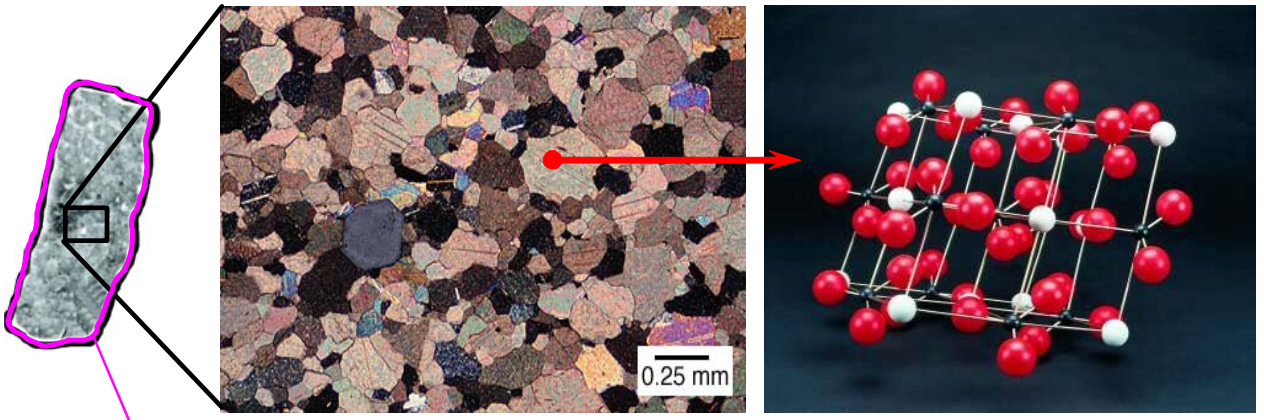
ΦΥΣΙΚΟΧΗΜΙΚΕΣ ΔΙΕΡΓΑΣΙΕΣ ΣΕ <u>ΔΙΕΠΙΦΑΝΕΙΕΣ</u> ΟΡΥΚΤΩΝ

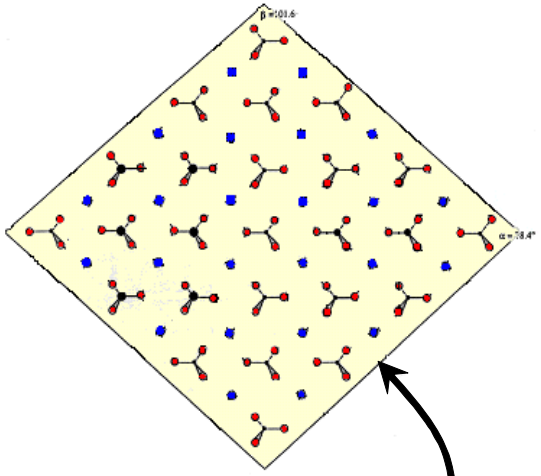
- **ΔΙΑΛΥΤΟΠΟΙΗΣΗ**
  (διάβρωση, αποσάθρωση, αποικοδόμηση)

- **ΡΟΦΗΣΗ**
  (αντίδραση με ιόντα και μόρια)

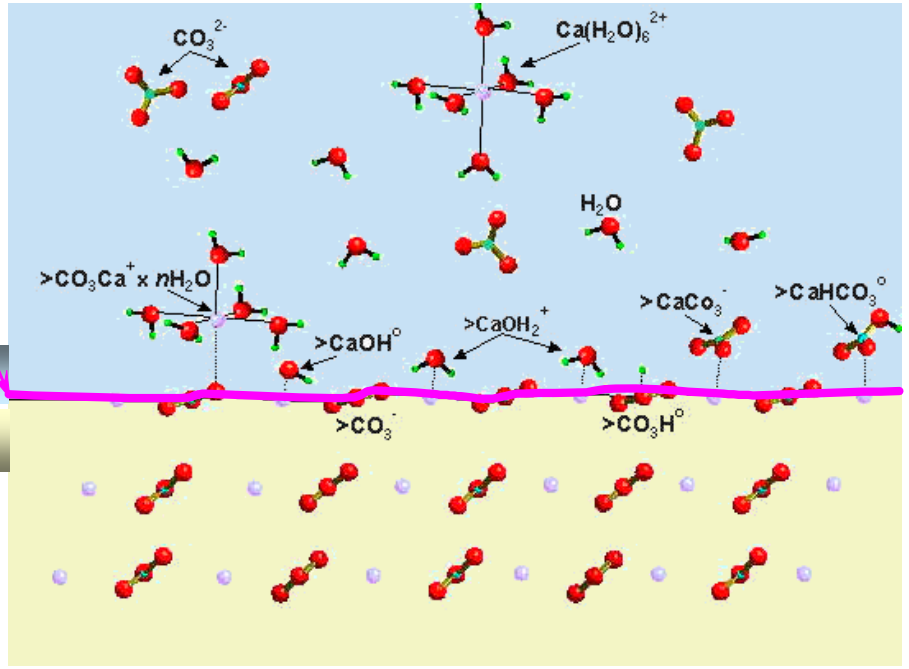
- **ΟΡΥΚΤΟΓΕΝΕΣΗ**
  (ανάπτυξη κρυστάλλων μέσω ετερογενούς πυρήνωσης)





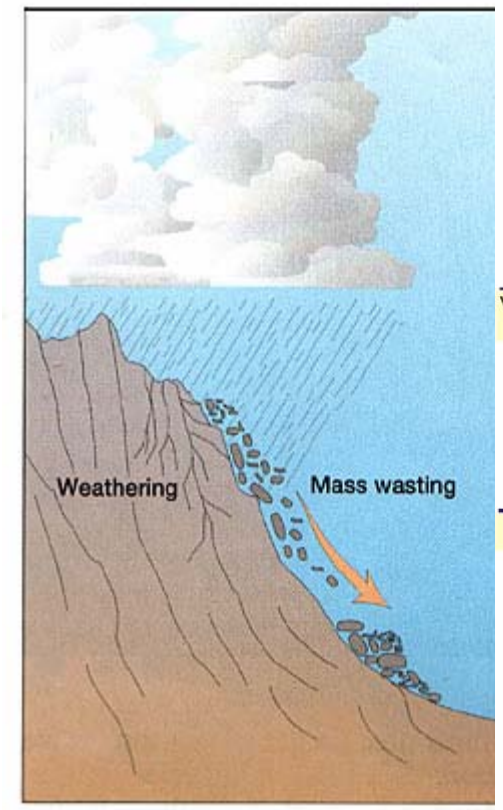


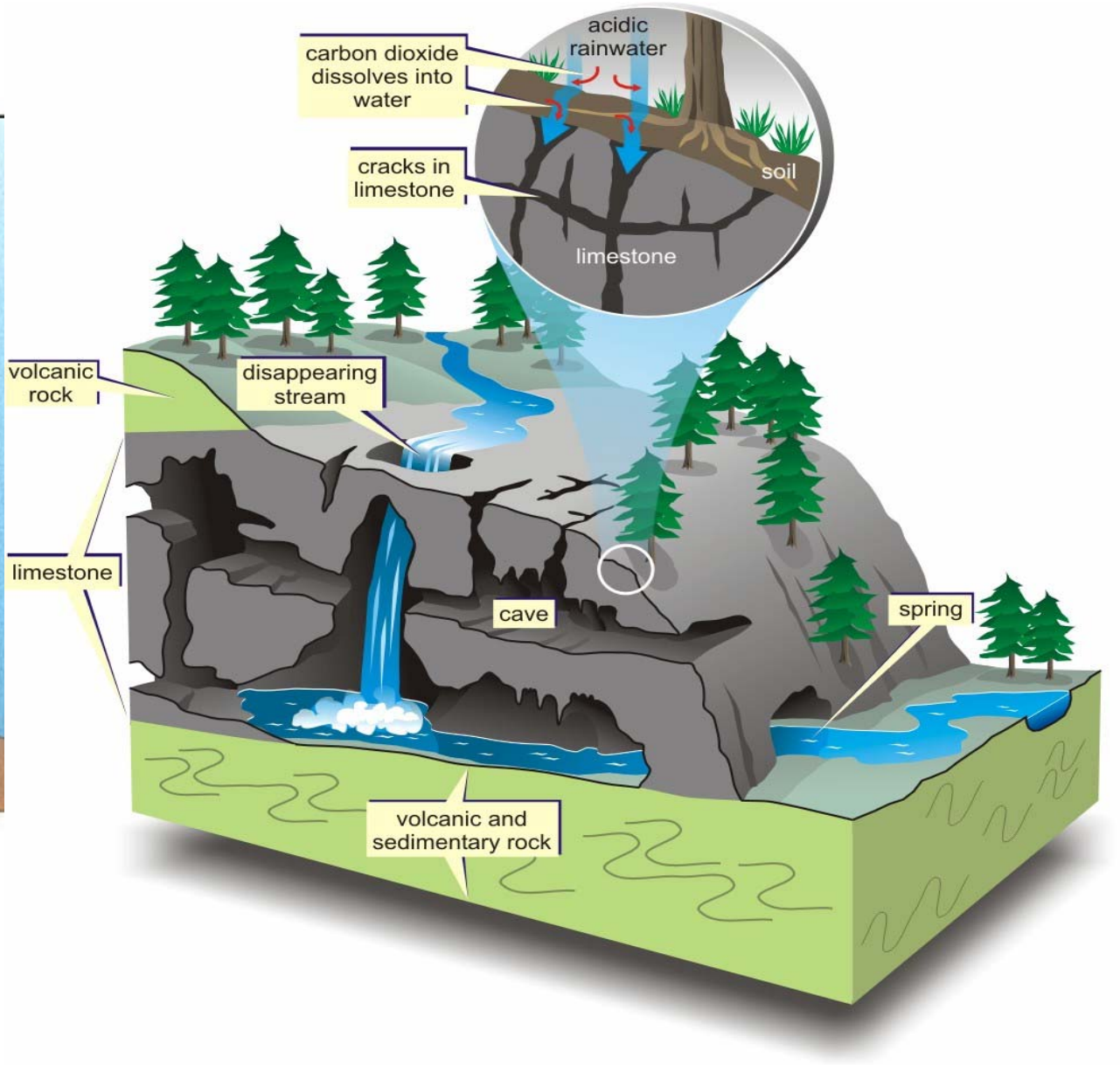
ΔΙΕΠΙΦΑΝΕΙΑ



ΜΑΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (Km/m/cm/mm-κλίμακα)

ΜΑΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (Km/m/cm/mm-κλίμακα)





WORKING GROUP "NATURAL STONES AND WEATHERING"

Diese Seite auf deutsch

- Investigation at monuments
- Monument mapping
- Classification scheme of weathering forms
- Photo atlas of weathering forms on stone monuments
- Stone analysis
- Microstructure analysis
- Weathering simulation
- Research

- National and international research projects
- Reference list - Monuments
- Services
- Instrumentation
- Publications
- Case study "Weathering damage on Islamic limestone monuments in Cairo / Egypt"
- Case study "Weathering damage on Pharaonic sandstone monuments in Upper Egypt"
- Case study "Eifeldom" - St. Lambertus Church / Monschau - Kalterherberg, Germany (in German)

Natural stones were used as building material at historically important buildings and monuments as well as at modern and industrial buildings. The drastic increase of weathering damages at these monuments, especially at cultural monuments, requires urgent preservation measures on the basis of newest research results. Knowledge of the weathering state of monuments, of material properties of stones used and of material alterations owing to weathering is the basis for the explanation of the complex weathering processes and causes of damages and therefore important for planning and execution of preservation measures and for prevention of damages.

Concerted Action
ERB-IC18-CT98-0384

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Conclusions
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European Commission
Research DG – INCO-MED

Concerted Action ERB-IC18-CT98-0384

STUDY, CHARACTERIZATION AND ANALYSIS OF DEGRADATION PHENOMENA OF ANCIENT, TRADITIONAL AND IMPROVED BUILDING MATERIALS OF GEOLOGIC ORIGIN USED IN CONSTRUCTION OF HISTORICAL MONUMENTS IN THE MEDITERRANEAN AREA

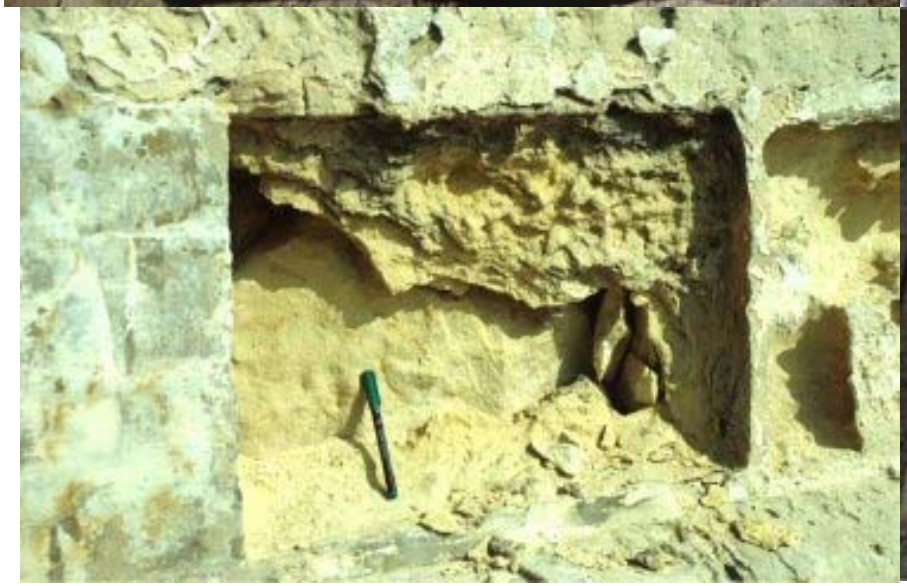
Period: October 1998 to October 2001

Coordination:

Universitat Autónoma de Barcelona
Prof. José Luis Briansó-Penalva

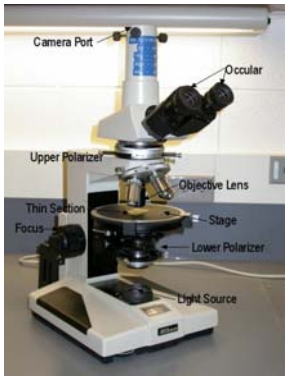
- ΑΣΒΕΣΤΟΛΙΘΟΙ, ΜΑΡΜΑΡΑ
- ΨΑΜΜΙΤΕΣ, ΓΡΑΟΥΒΑΚΕΣ, ΤΟΦΦΟΙ
- ΒΑΣΑΛΤΕΣ, ΓΡΑΝΙΤΕΣ

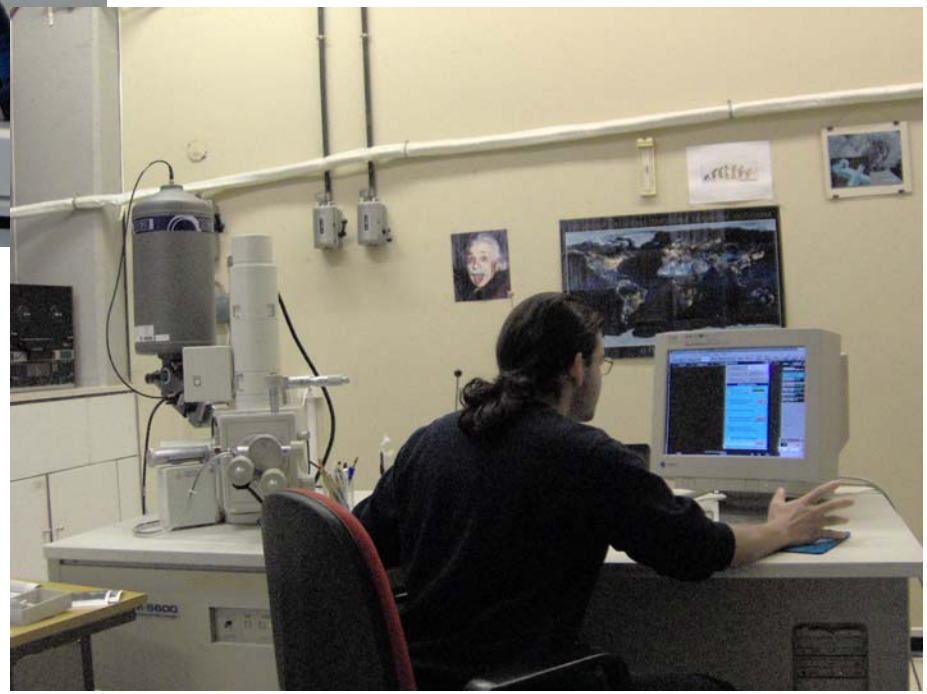
ΜΑΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (Km/m/cm/mm-κλίμακα)



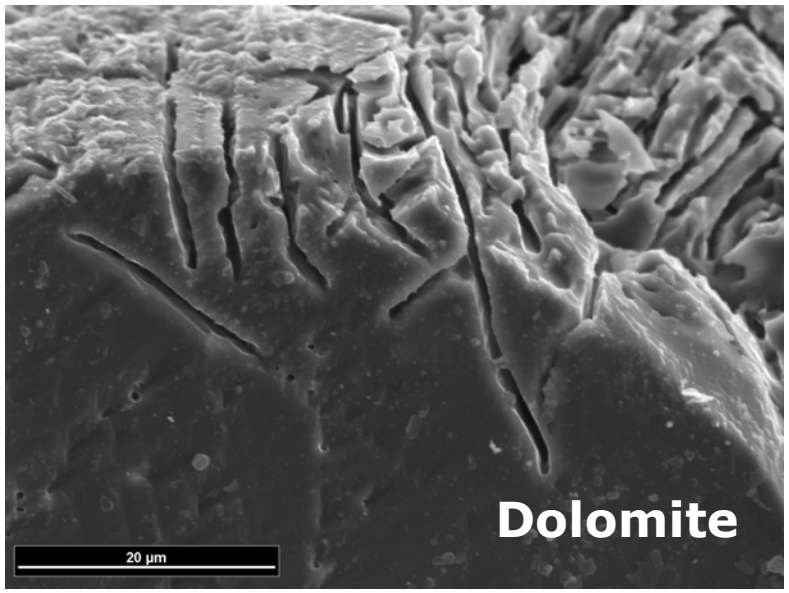
ΜΑΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (Km/m/cm/mm-κλίμακα)

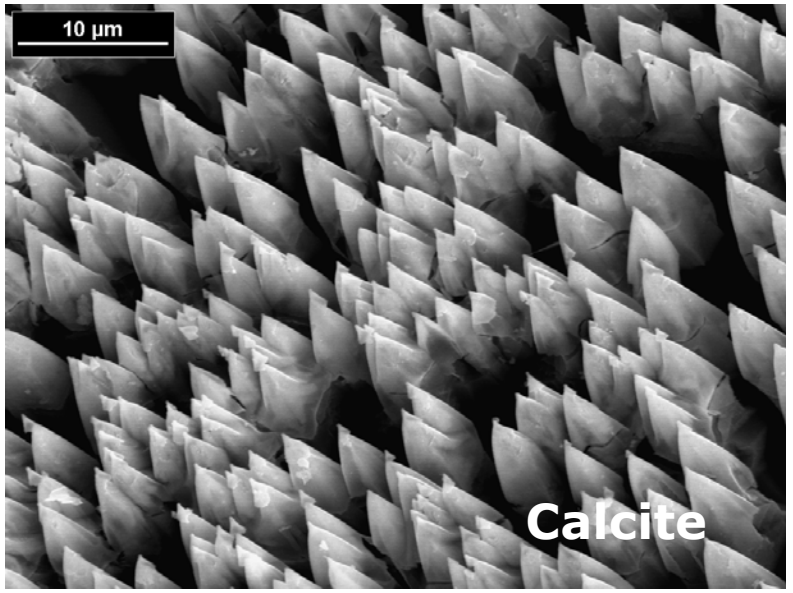
ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (mm/μm-κλίμακα)



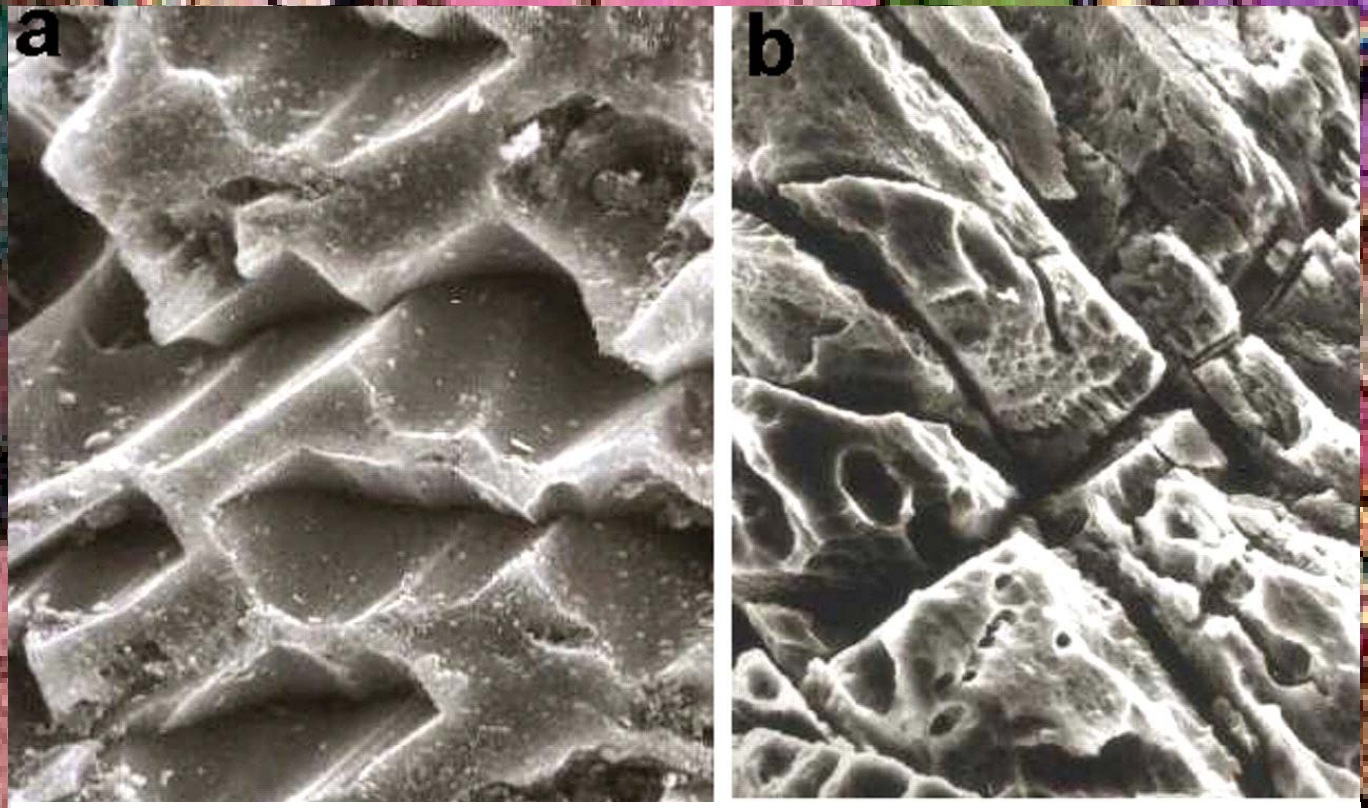


ΜΑΚΡΟΣΚΟΠΙΚΗ - ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (Km/m/cm/mm/μm-κλίμακα)





ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (mm/μm-κλίμακα)



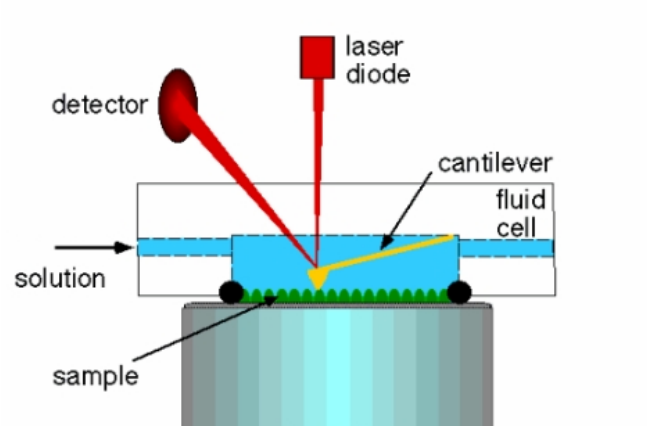
Olivine (100 μm)

0.5 mm

ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (nm/Å-κλίμακα)

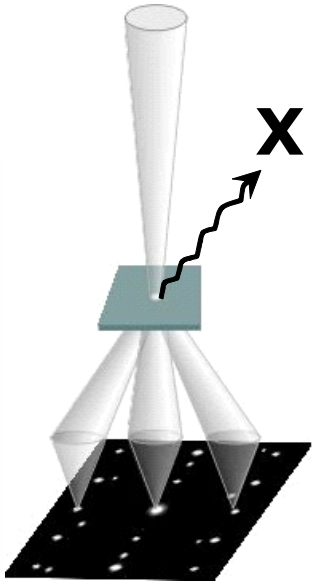
AFM

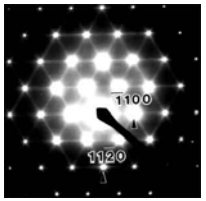
TEM

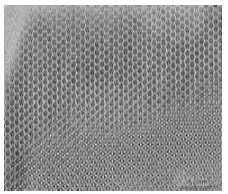


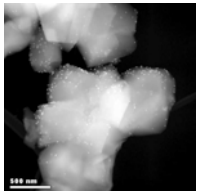
e^-

X

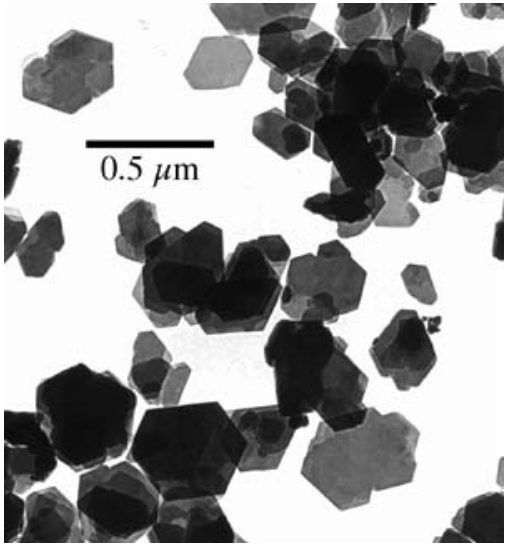


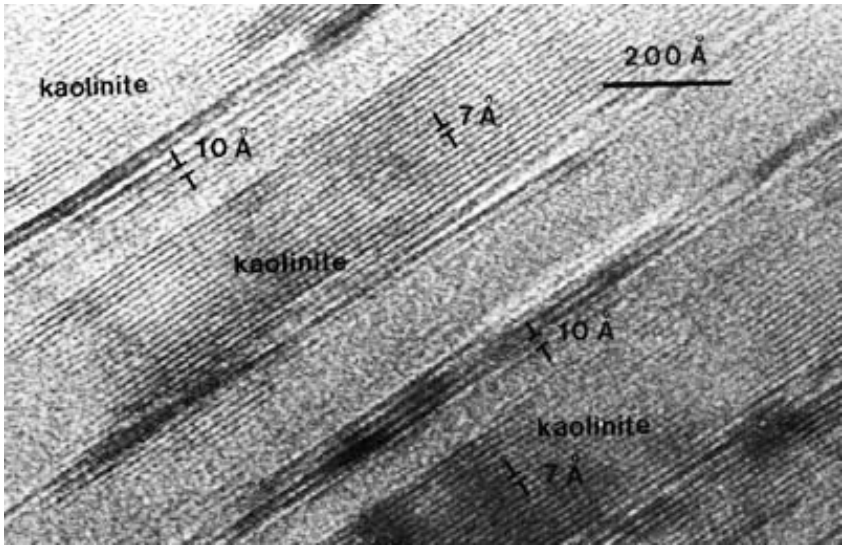


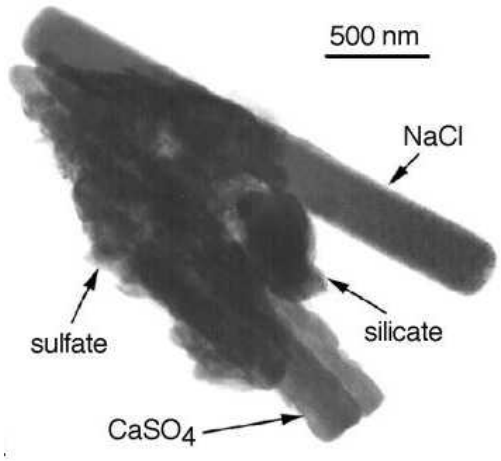


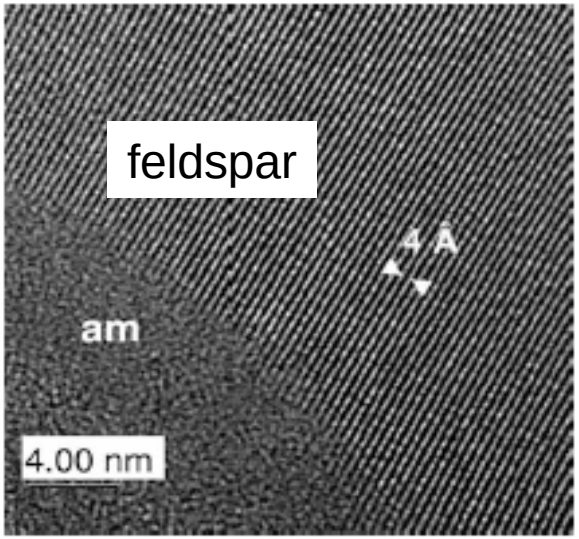


ex-situ ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (nm/Å-κλίμακα)

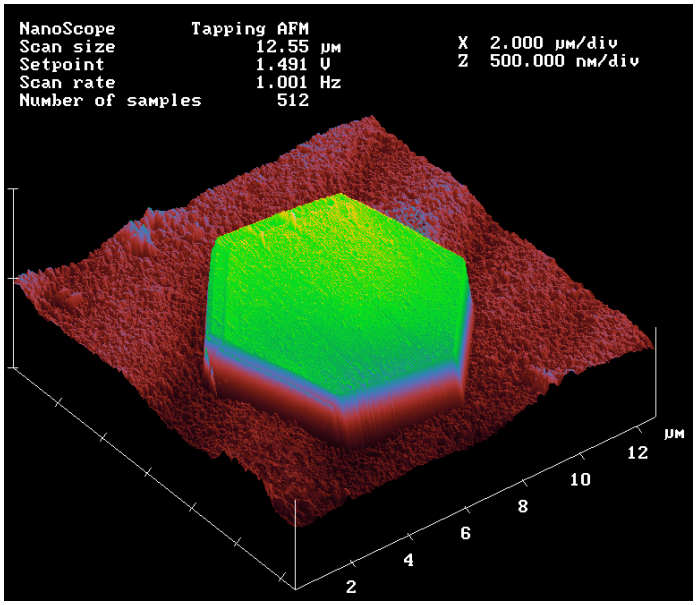


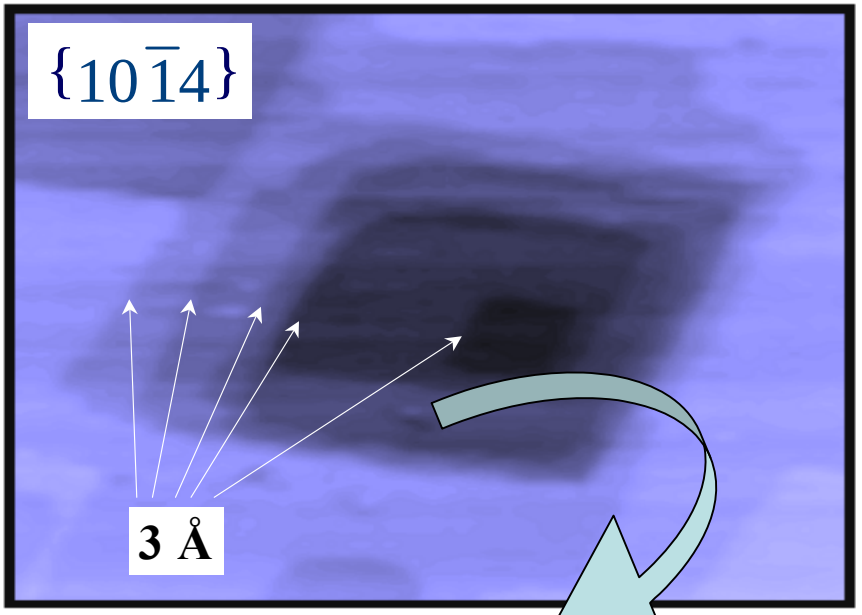


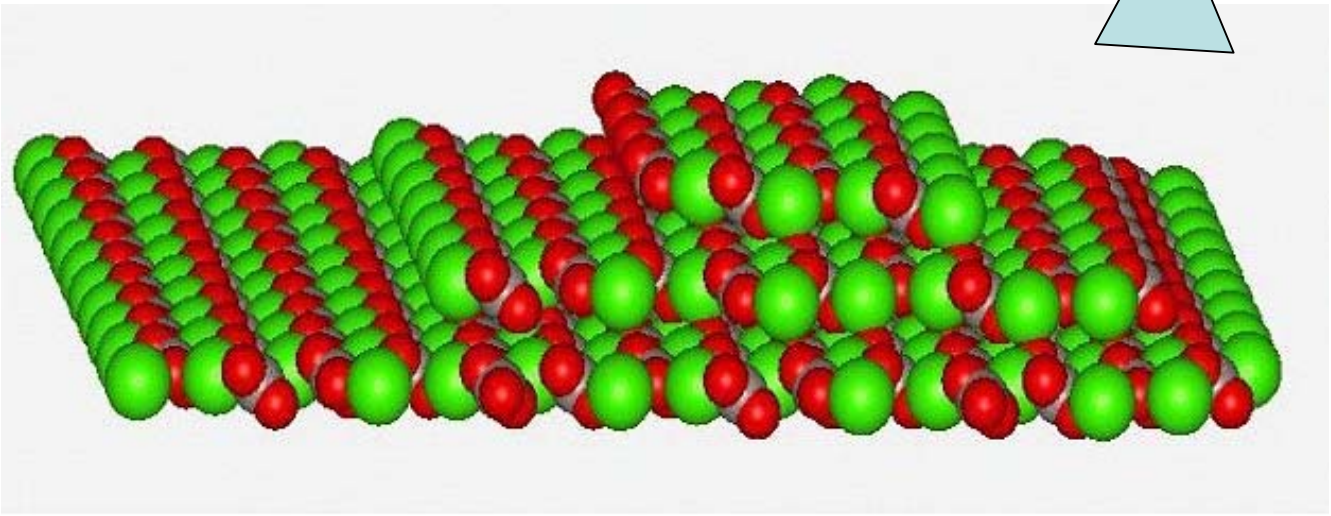


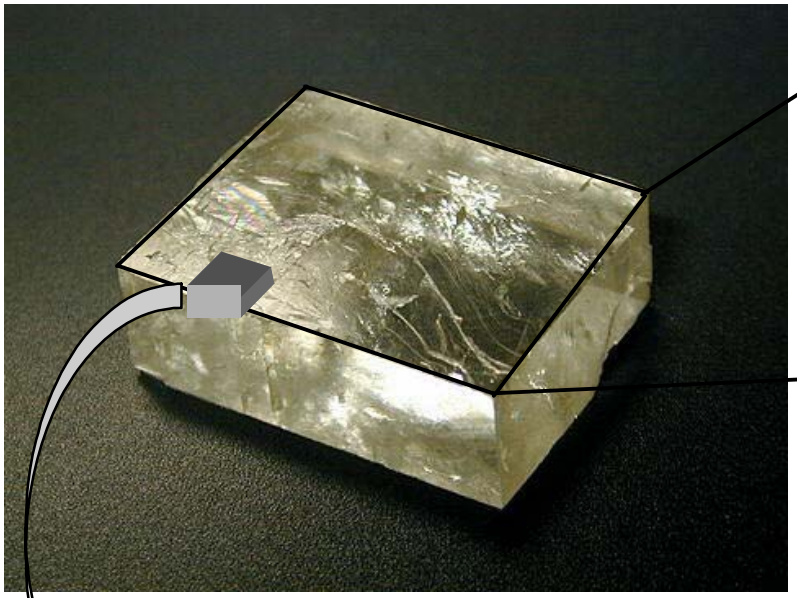


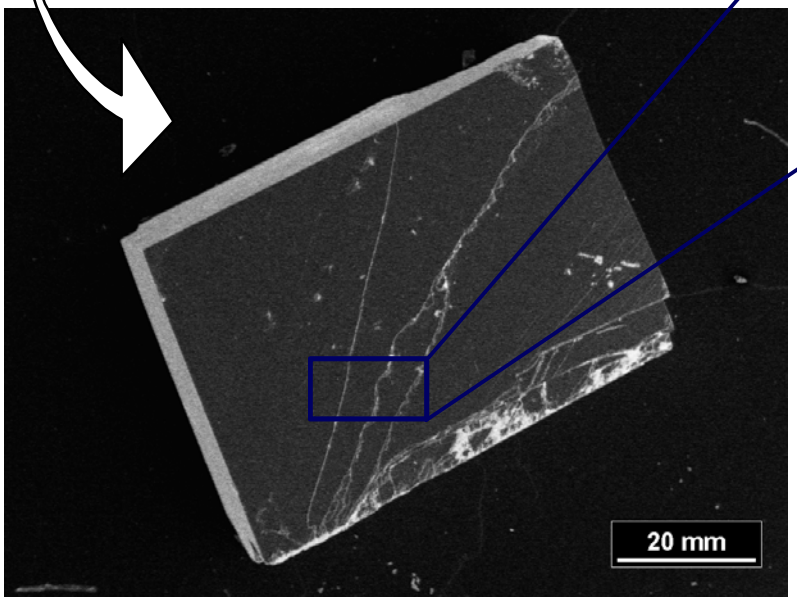
ex-situ & in-situ ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (nm/Å-κλίμακα)



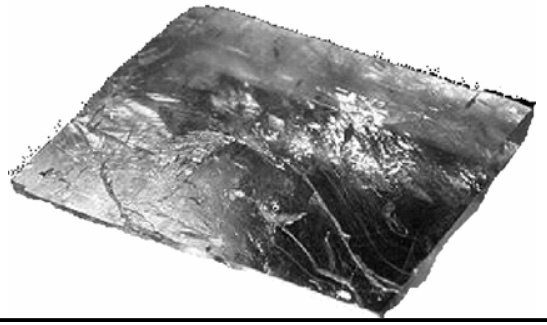




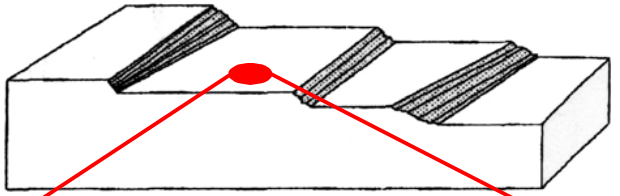




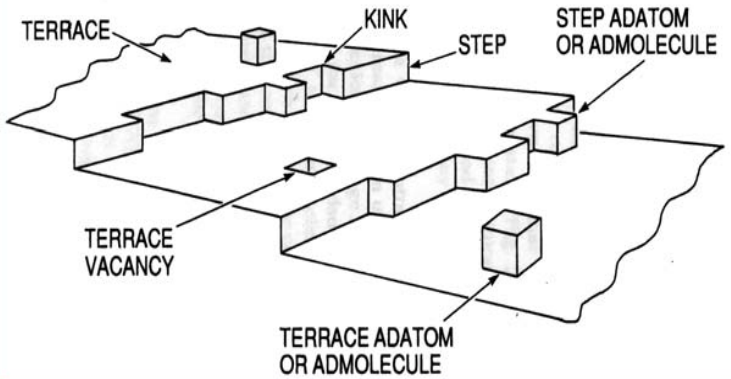
→ **Surface Macrotopography**

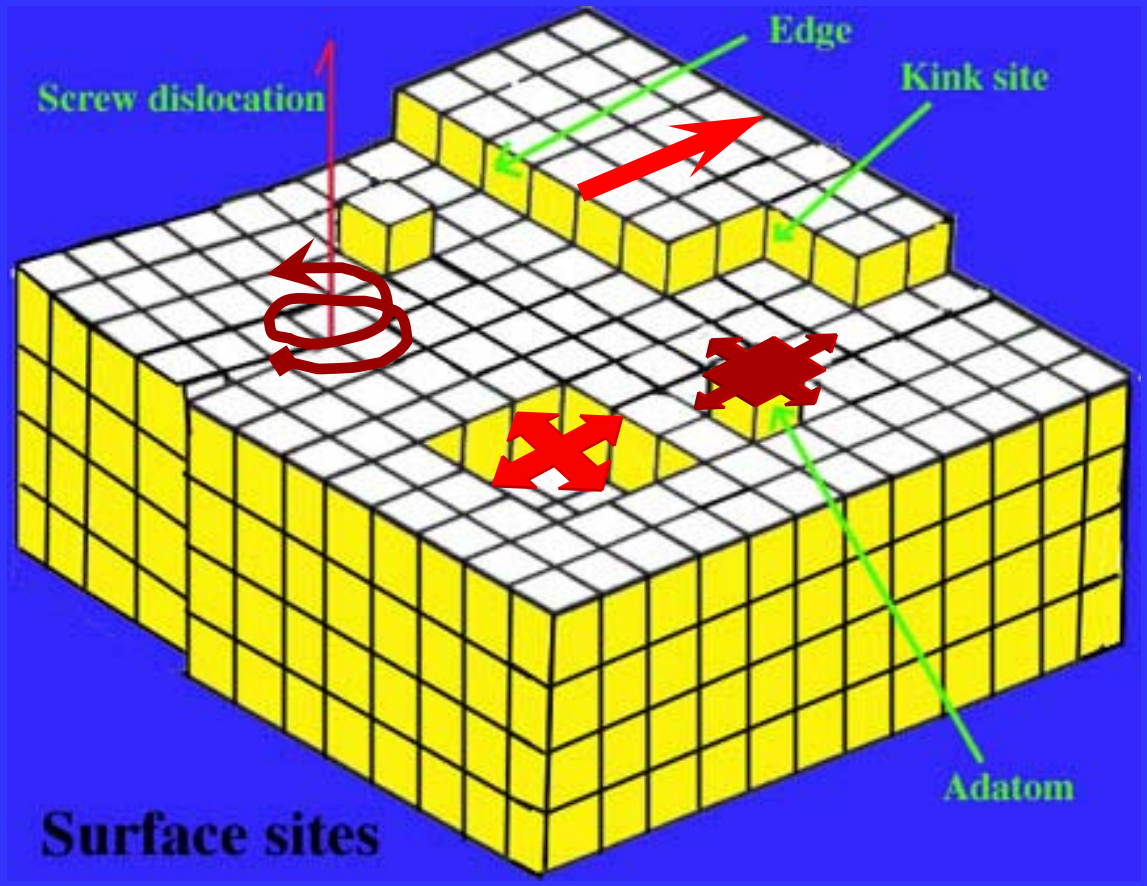


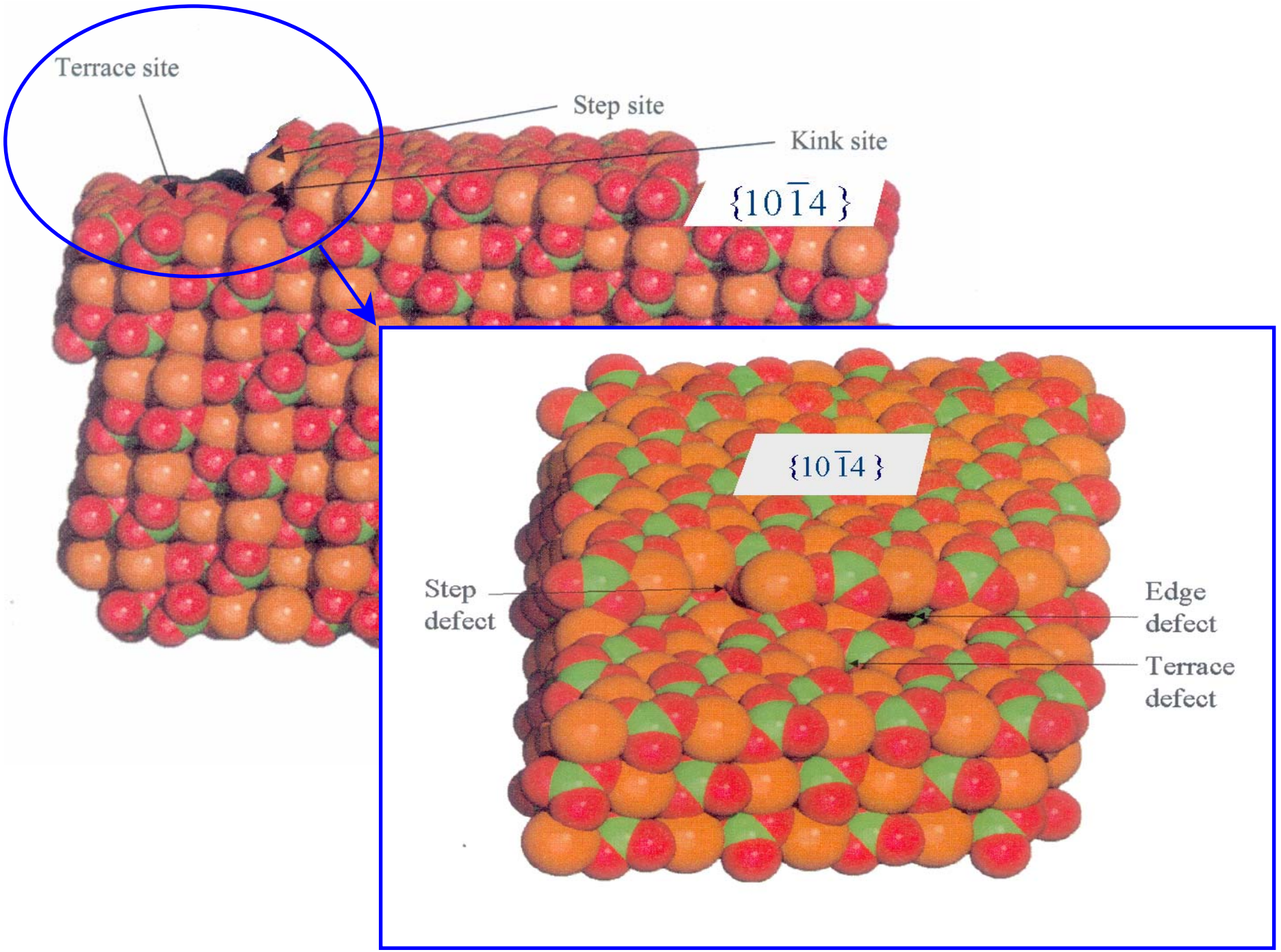
→ **Surface Microtopography**

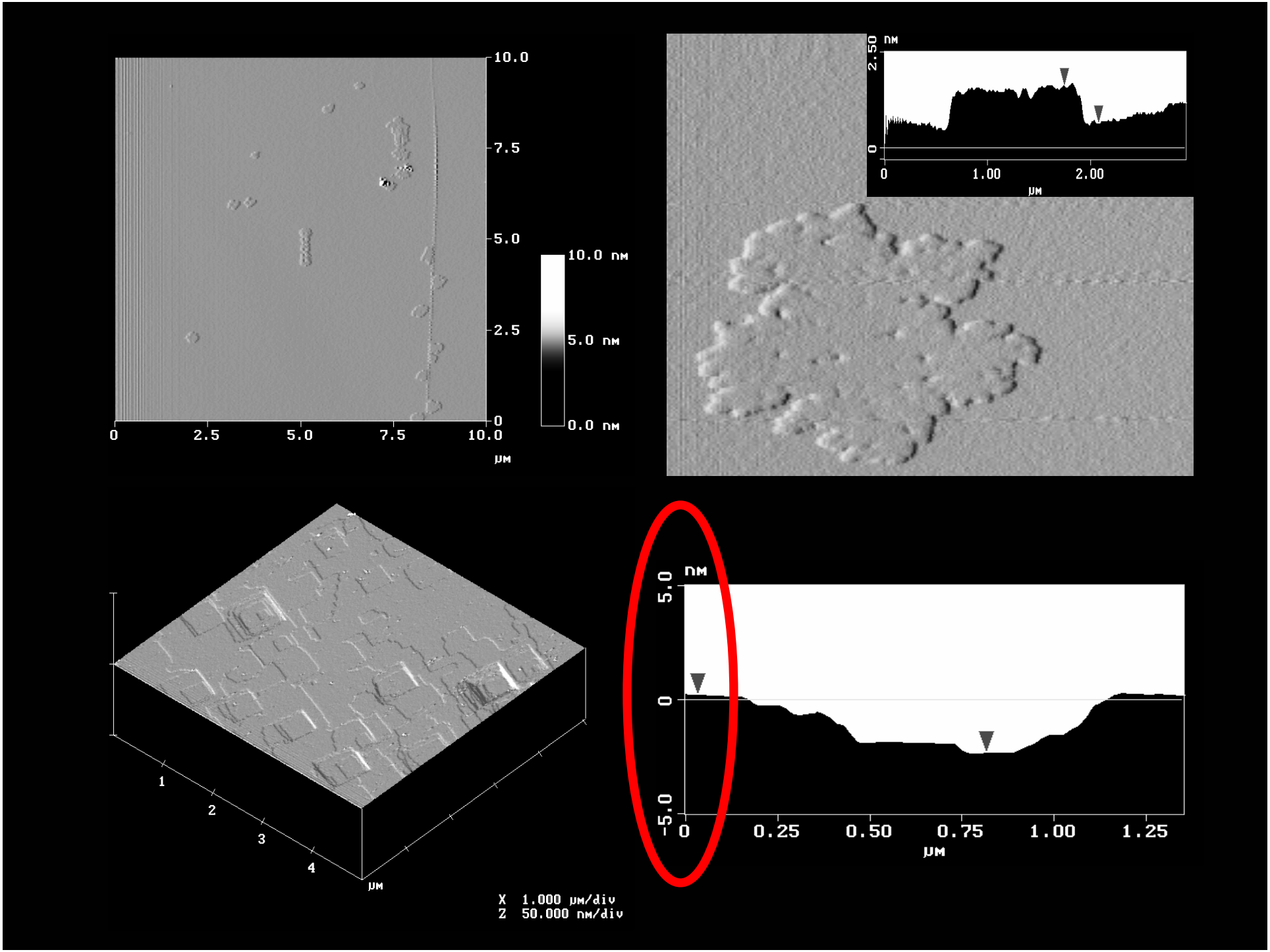


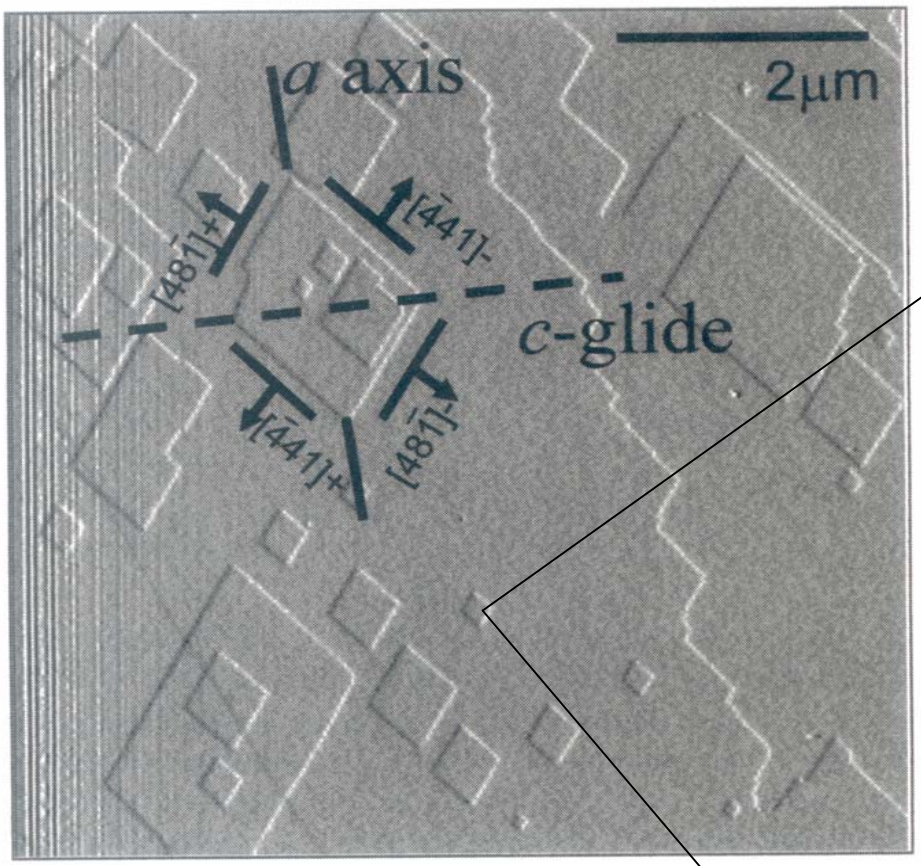
→ **Surface Nanotopography**

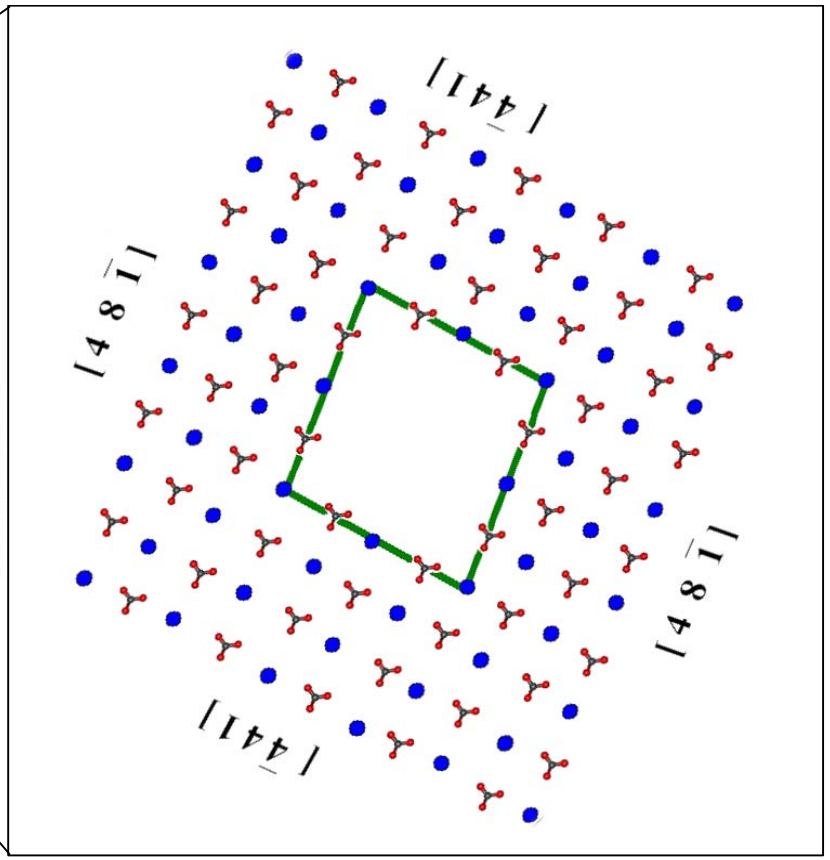



Edge
Kink site
Screw dislocation
Adatom
Surface sites


Terrace site
Step site
Kink site
{10$\bar{1}$4}
{10$\bar{1}$4}
Step defect
Edge defect
Terrace defect

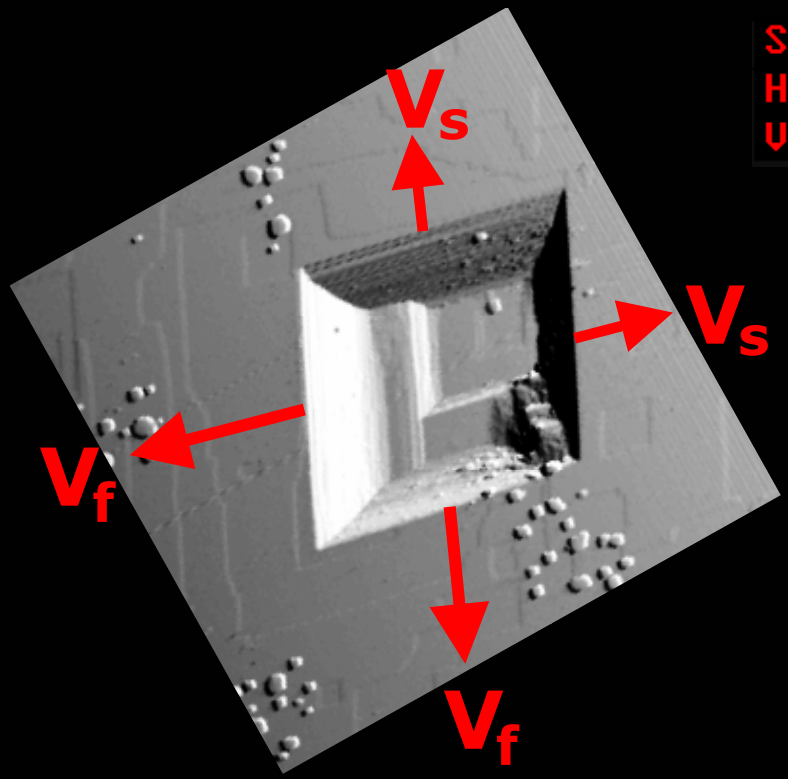

10.0
7.5
5.0
2.5
0
0
2.5
5.0
7.5
10.0
µm
10.0 nm
5.0 nm
0.0 nm
nm
2.50
0
0
1.00
2.00
µm
1
2
3
4
µm
X 1.000 µm/div
Z 50.000 nm/div
nm
5.0
0
-5.0
0
0.25
0.50
0.75
1.00
1.25
µm


a axis
2μm
[48$\bar{1}$]+
[$\bar{4}$41]-
c-glide
[$\bar{4}$41]+
[48$\bar{1}$]-

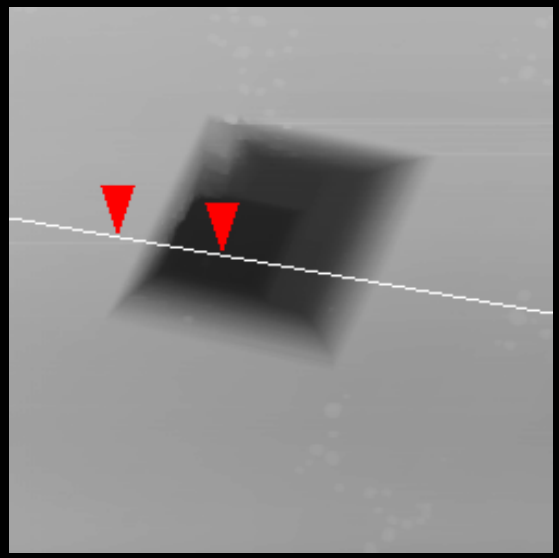

[$\bar{4}$41]
[4 8 $\bar{1}$]
[$\bar{4}$41]
[4 8 $\bar{1}$]

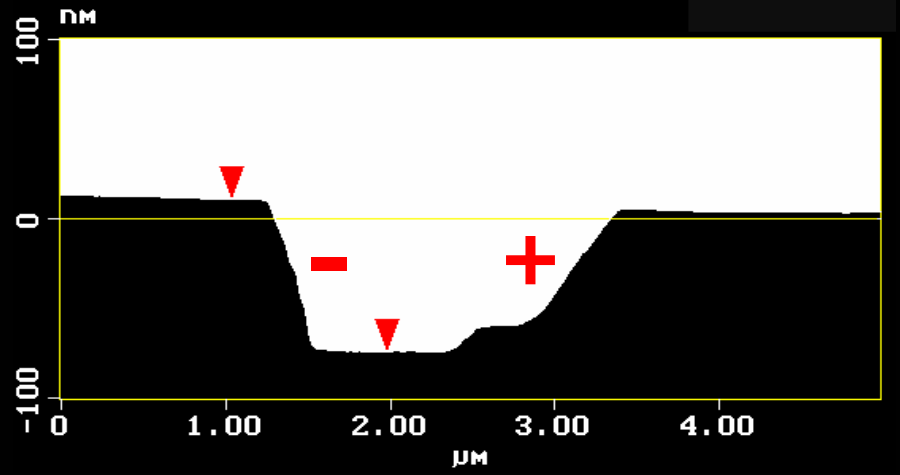
ΑΝΙΣΟΤΡΟΠΗ ΔΙΑΛΥΤΟΠΟΙΗΣΗ ΤΗΣ ΕΠΙΦΑΝΕΙΑΣ

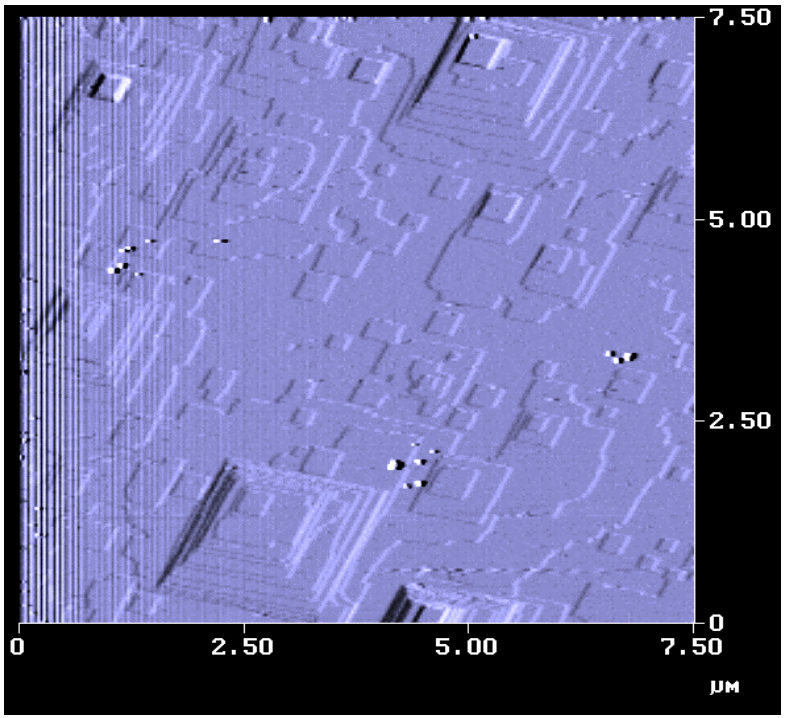
$V_f > V_s$ (nm s^{-1})

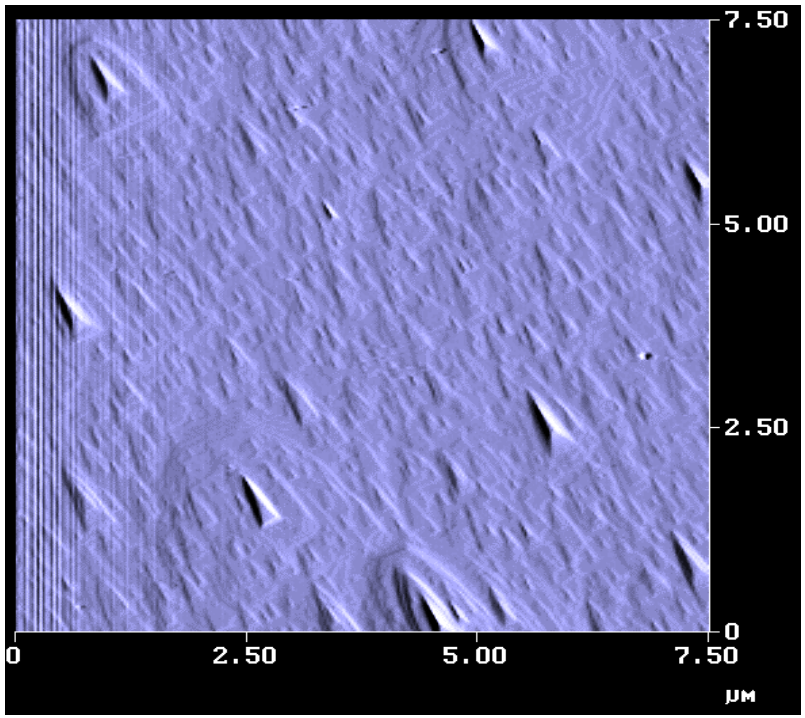


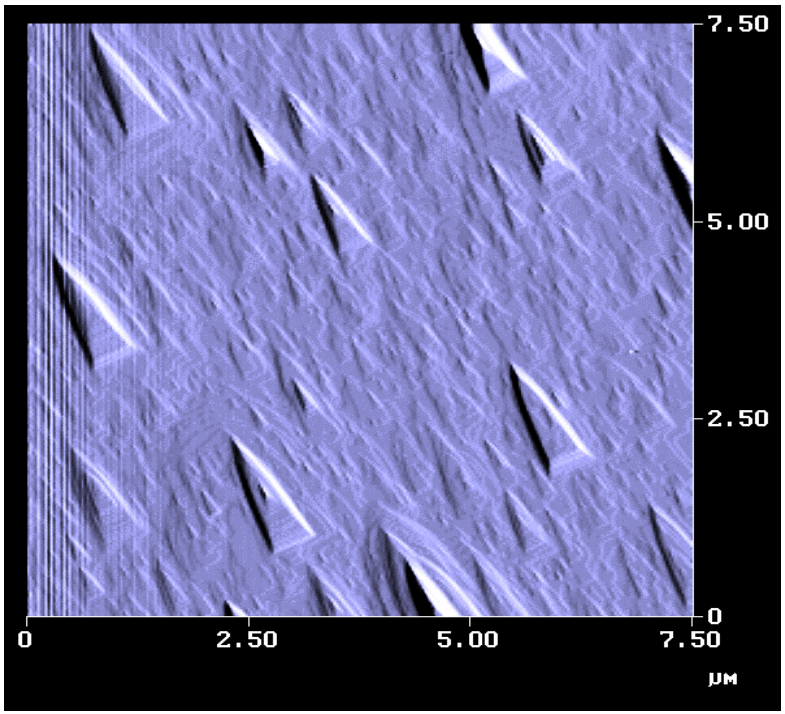
Surface 958.72 nm
Horiz 943.92 nm
Vert 84.625 nm

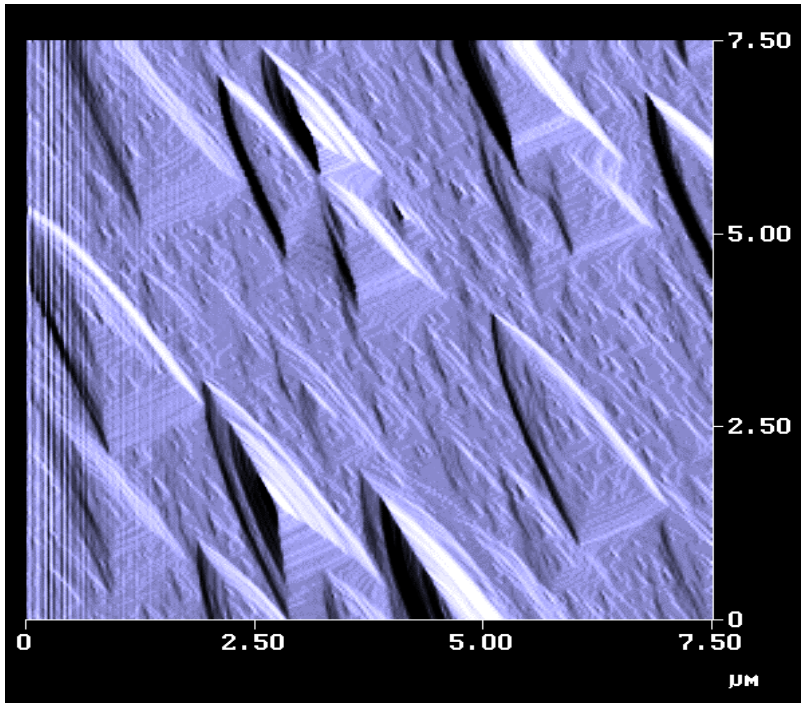


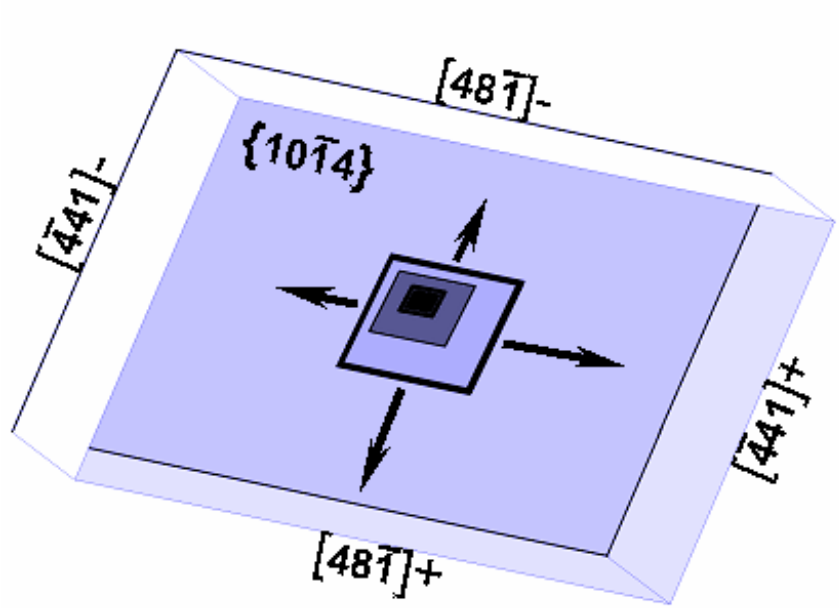


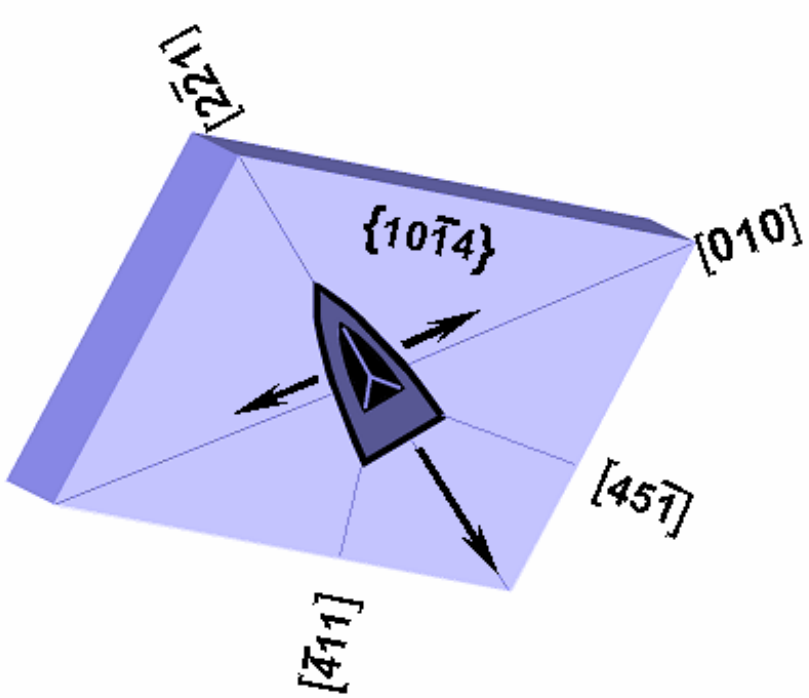

7.50
5.00
2.50
0
0
2.50
5.00
7.50
µm

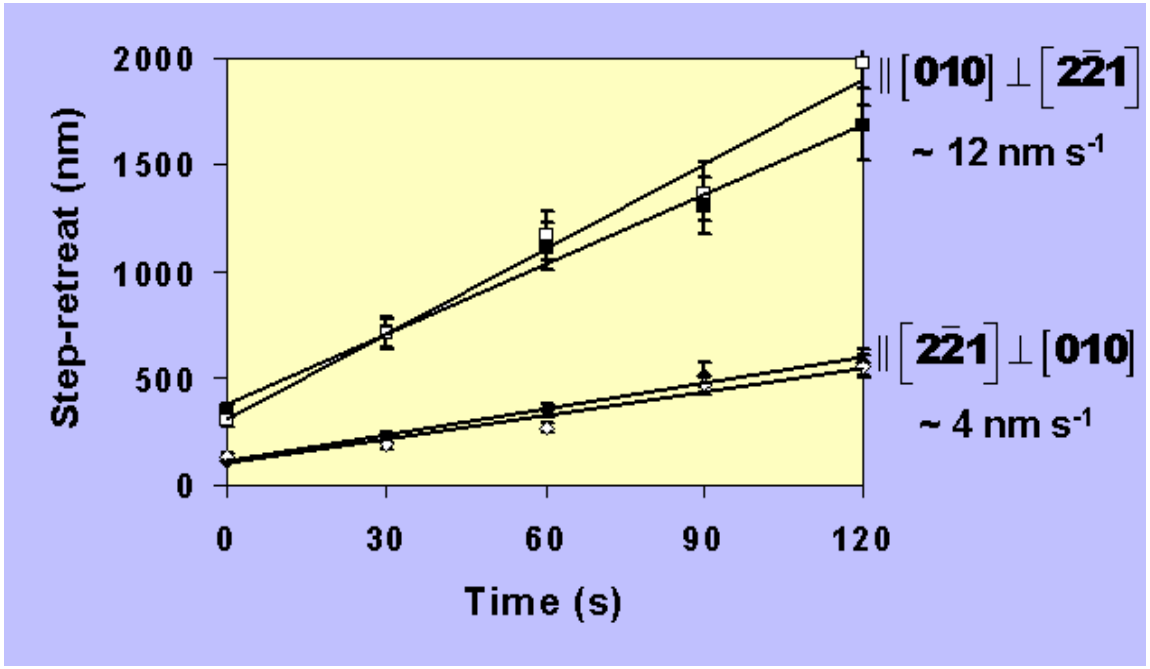

7.50
5.00
2.50
0
0
2.50
5.00
7.50
µm


7.50
5.00
2.50
0
0
2.50
5.00
7.50
µm


7.50
5.00
2.50
0
0
2.50
5.00
7.50
µm


{10$\bar{1}$4}
[48$\bar{1}$]-
[$\bar{4}$41]-
[$\bar{4}$41]+
[48$\bar{1}$]+


[2$\bar{2}$1]
{10$\bar{1}$4}
[010]
[45$\bar{1}$]
[$\bar{4}$11]


Step-retreat (nm)
2000
1500
1000
500
0
0
30
60
90
120
Time (s)
$\| [010] \perp [2\bar{2}1]$
~ 12 nm s^{-1}
$\| [2\bar{2}1] \perp [010]$
~ 4 nm s^{-1}

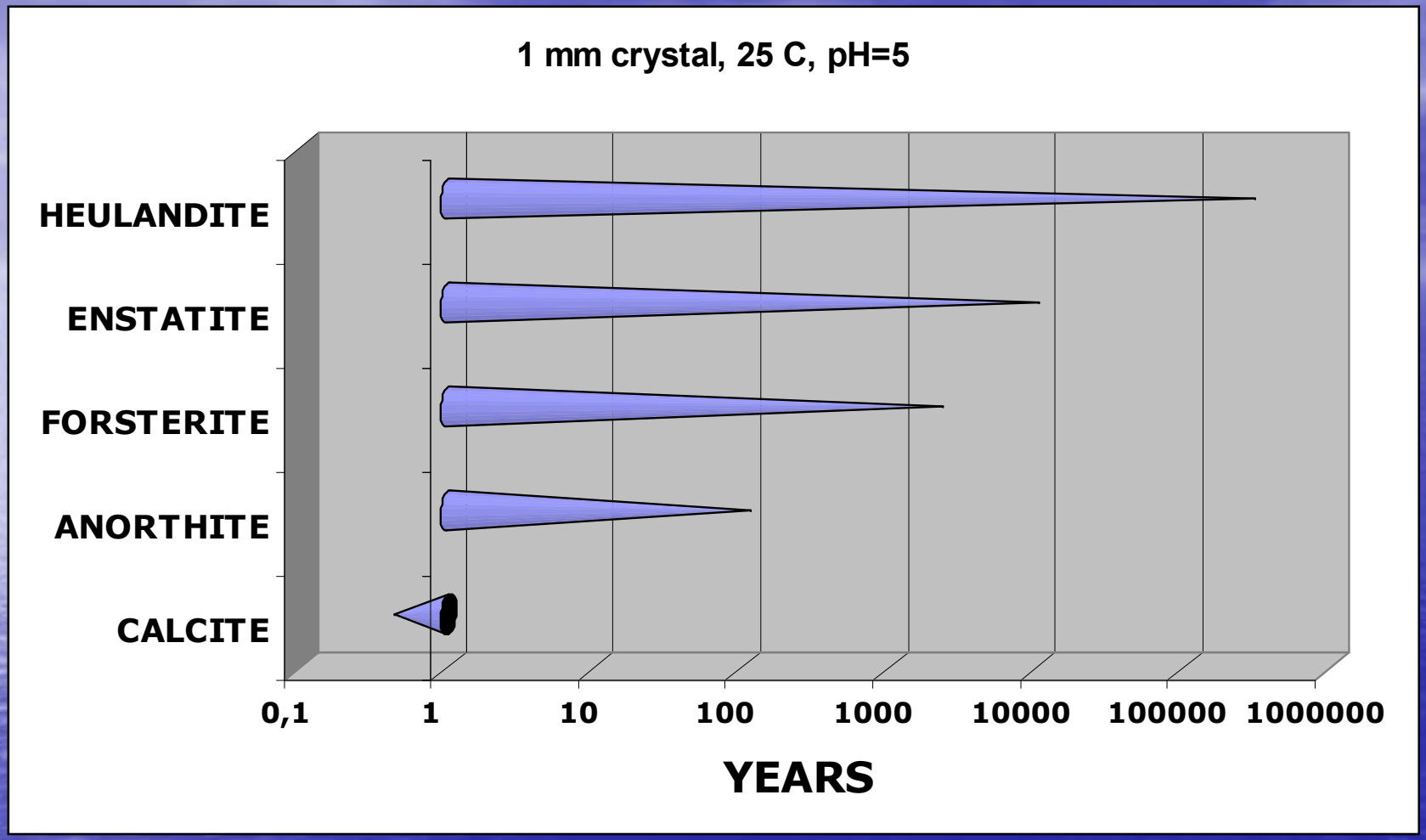
"ΜΑΚΡΟΣΚΟΠΙΚΟΙ" ΡΥΘΜΟΙ ΔΙΑΛΥΤΟΠΟΙΗΣΗΣ

Log rate (pH ~ 7) =

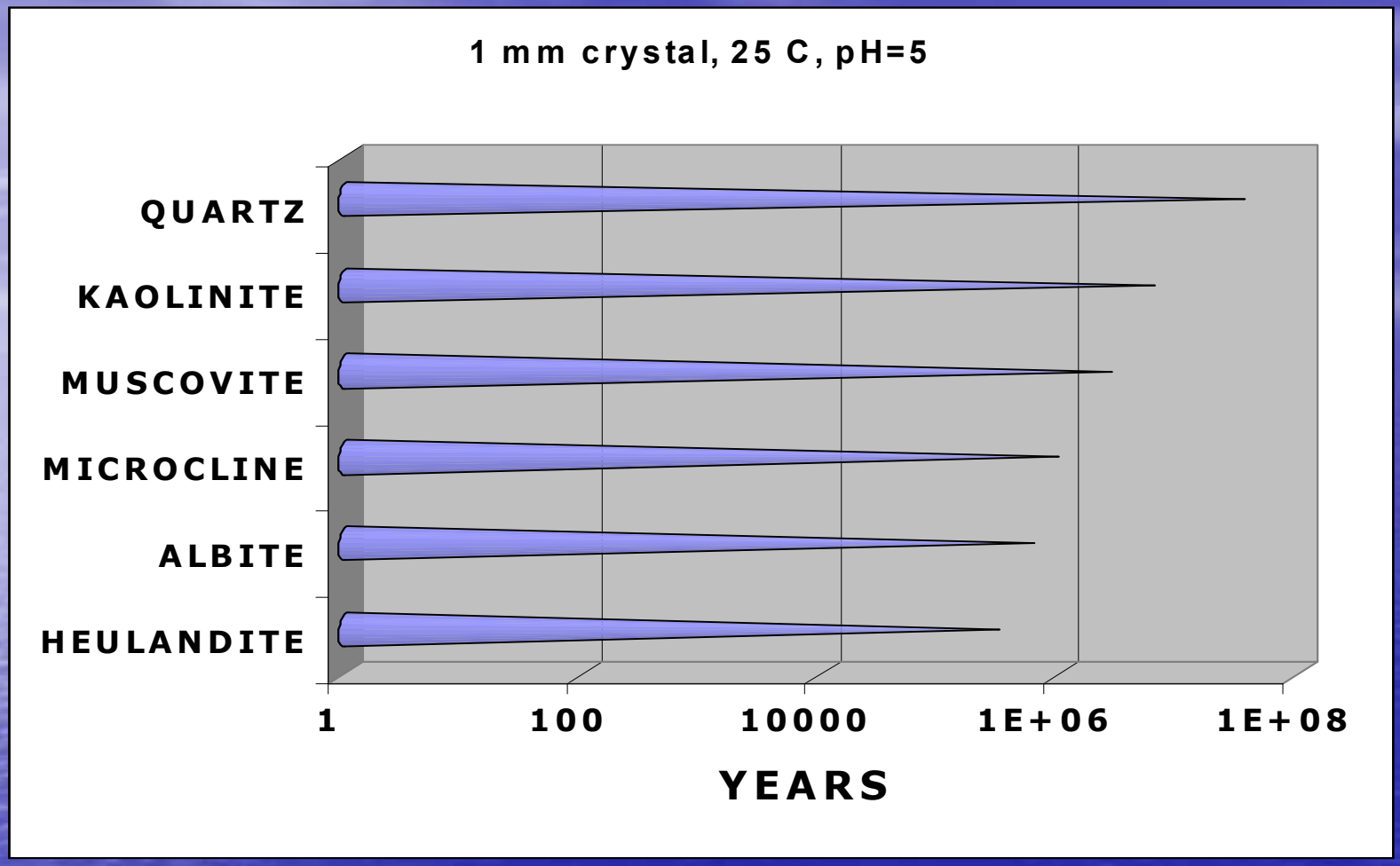
-15.8 mol cm^{-2} s^{-1}

1 mm

300 000 yrs

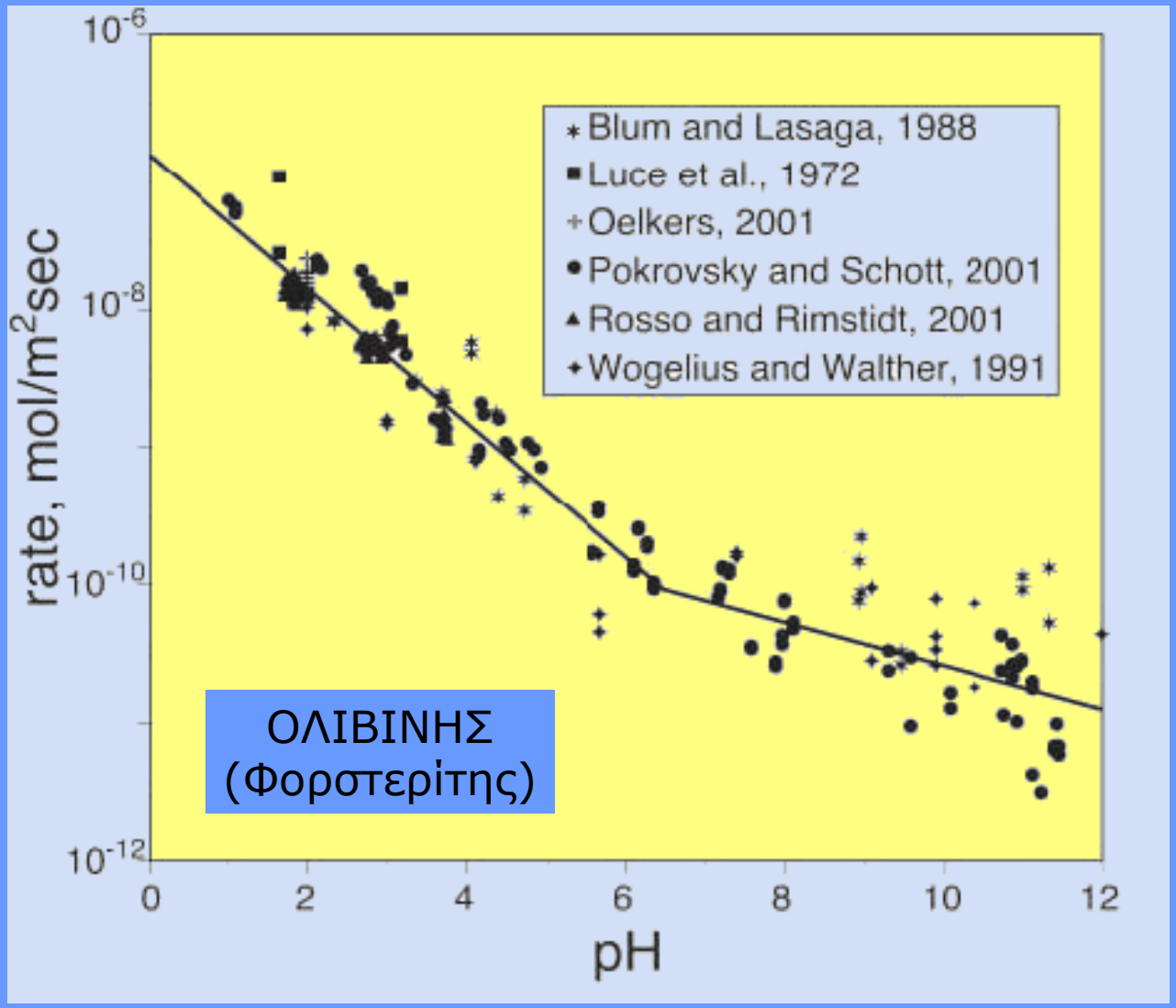


..... CALCITE : 150 days

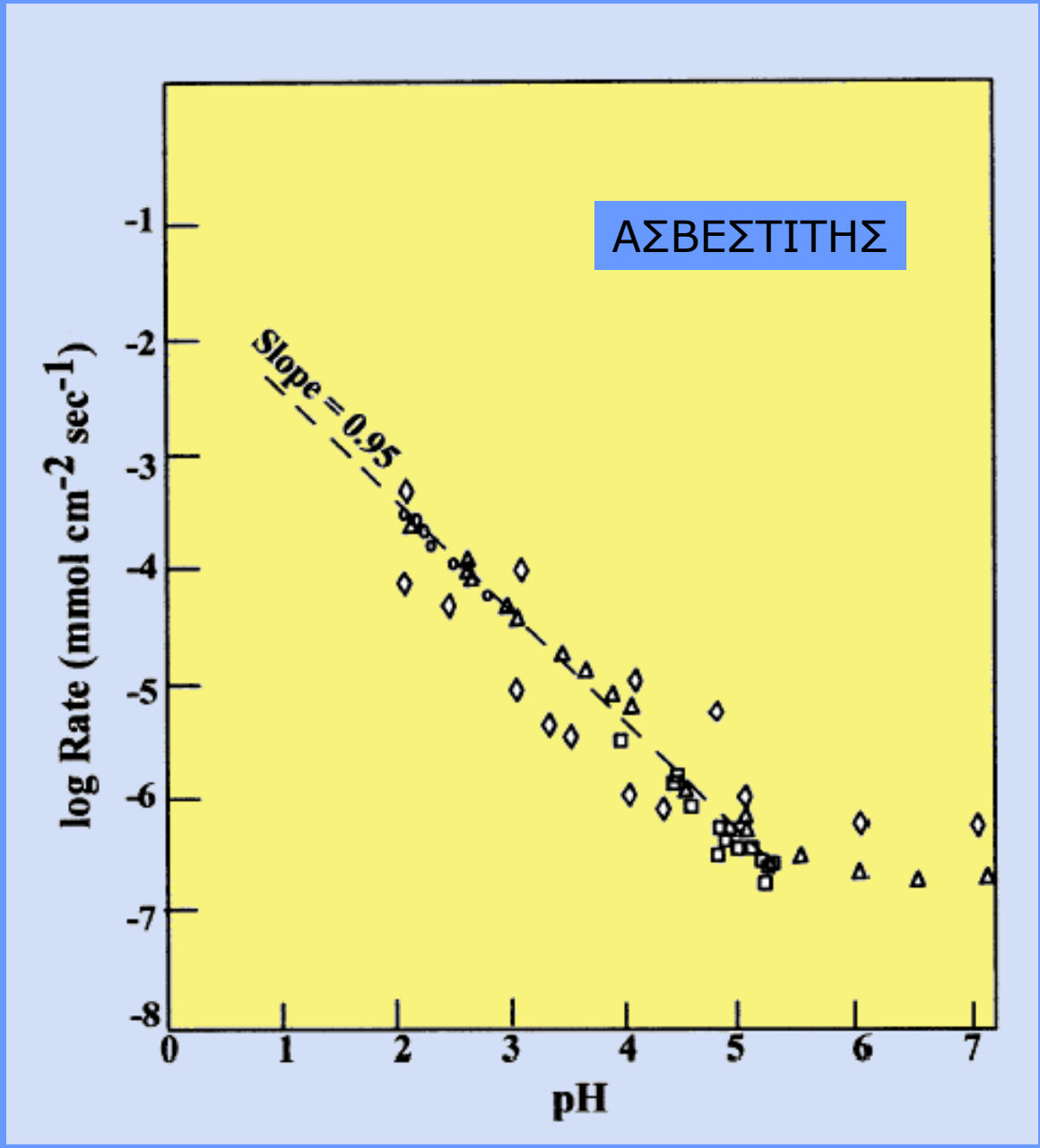


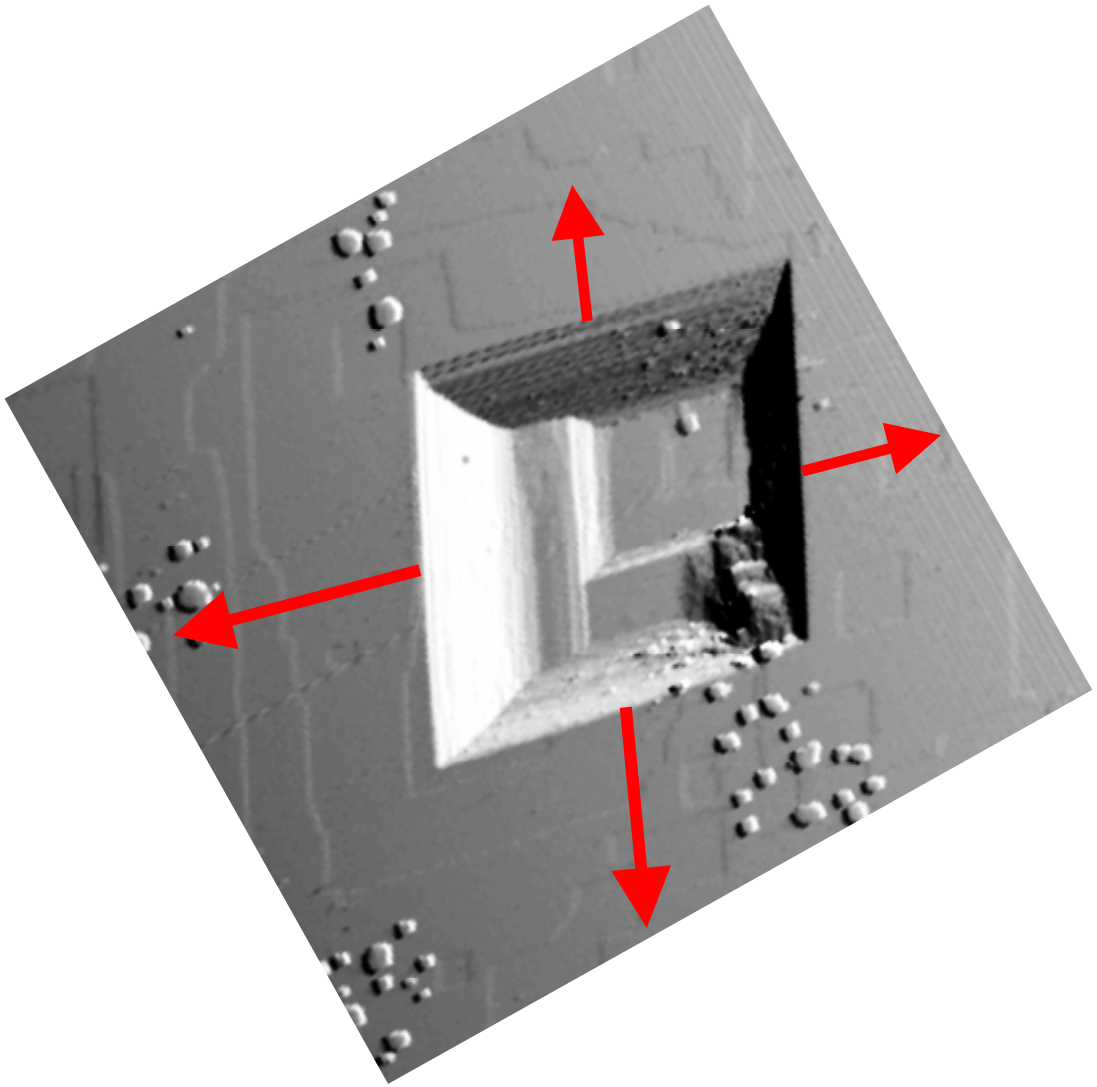
QUARTZ : 34 000 000 yrs .....

"ΜΑΚΡΟΣΚΟΠΙΚΟΙ" ΡΥΘΜΟΙ ΔΙΑΛΥΤΟΠΟΙΗΣΗΣ

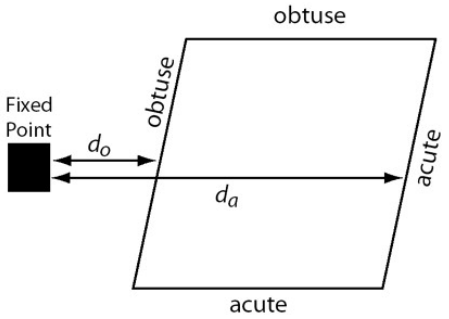


"ΜΑΚΡΟΣΚΟΠΙΚΟΙ" ΡΥΘΜΟΙ ΔΙΑΛΥΤΟΠΟΙΗΣΗΣ

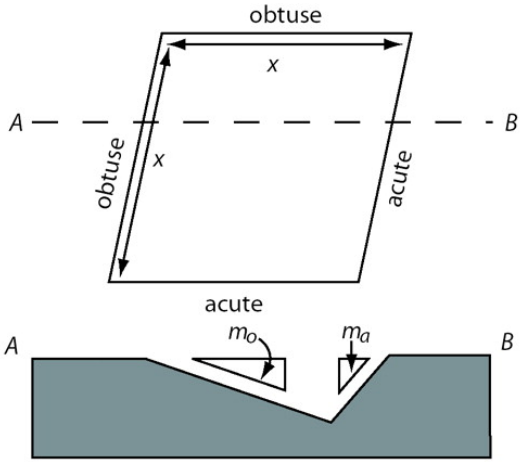




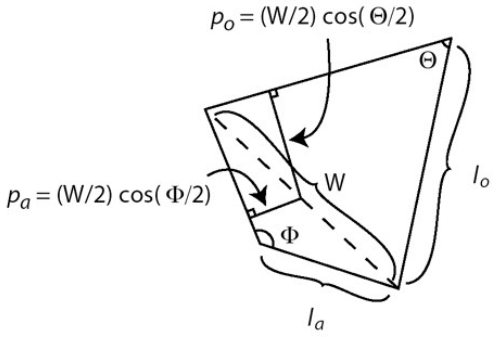
Method One

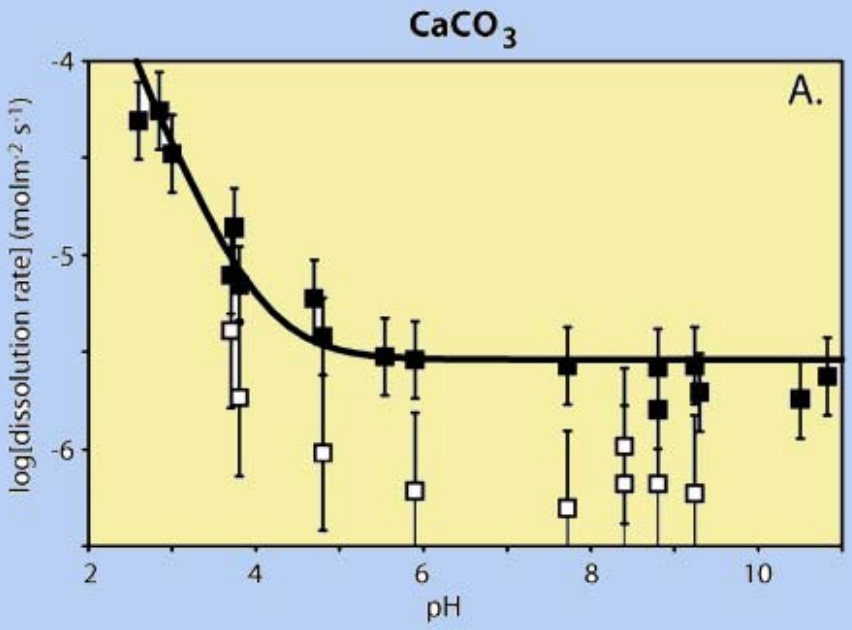


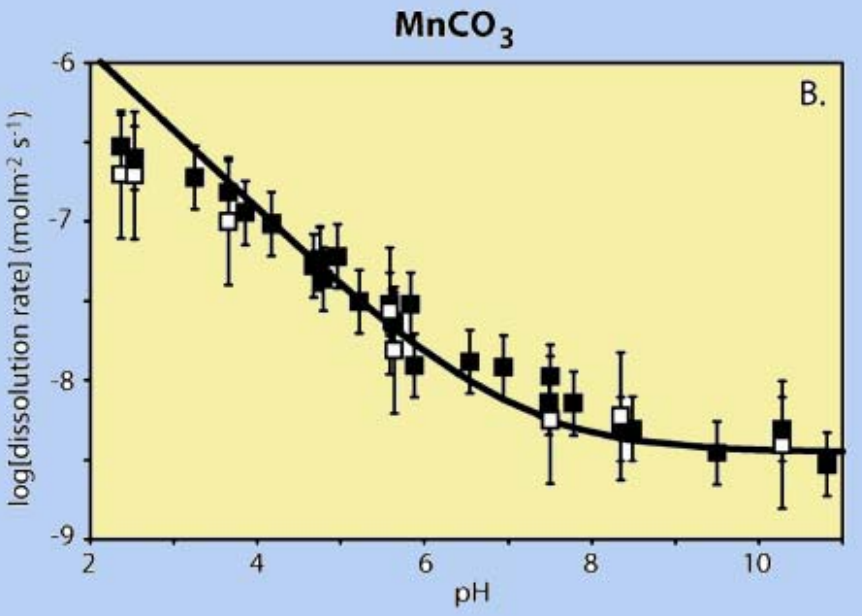
Method Two



Method Three

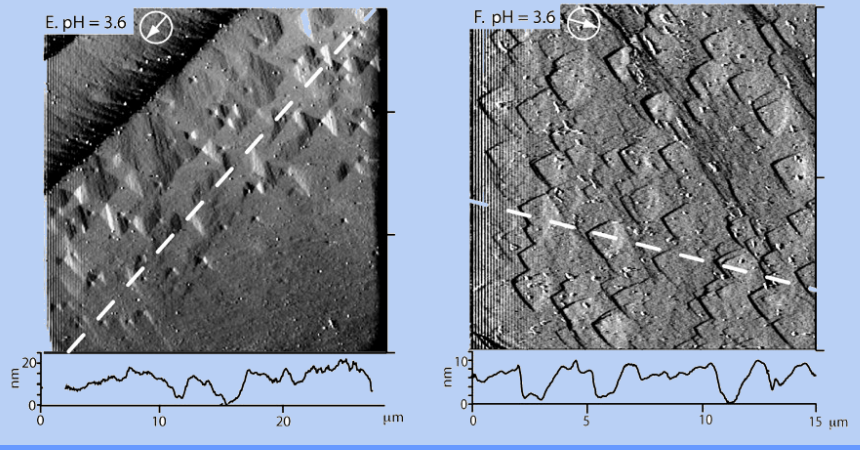


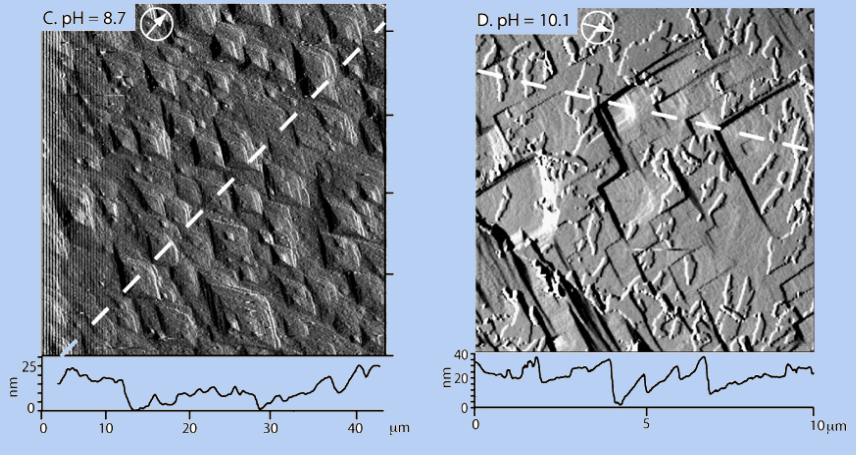




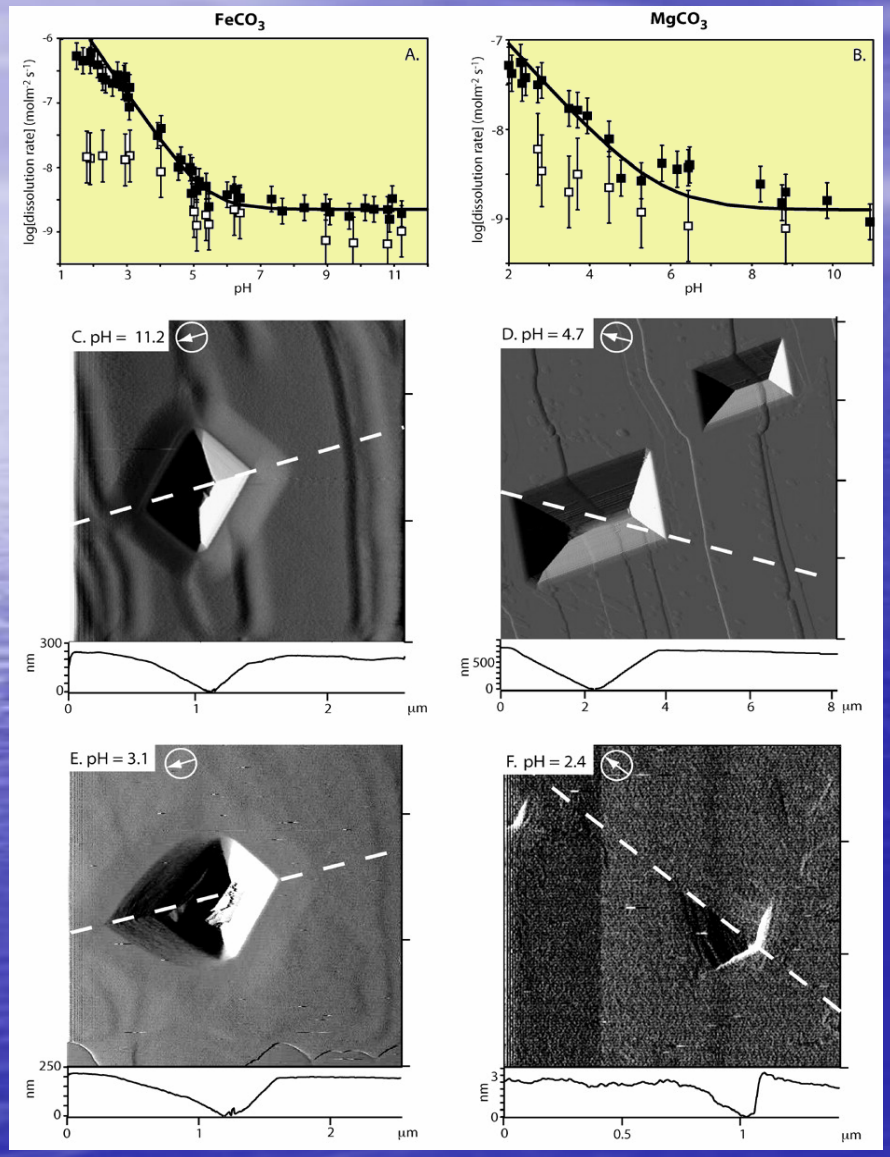
"ΜΑΚΡΟΣΚΟΠΙΚΟΙ" ΡΥΘΜΟΙ ΔΙΑΛΥΤΟΠΟΙΗΣΗΣ

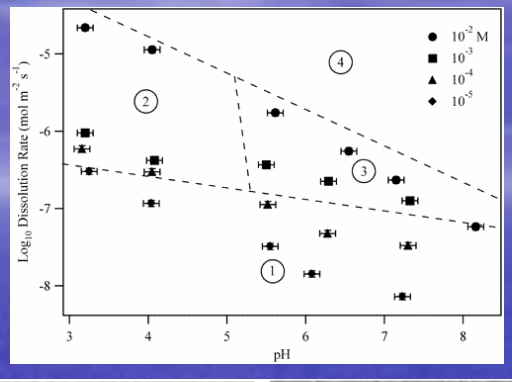
"ΜΙΚΡΟΣΚΟΠΙΚΟΙ" ΡΥΘΜΟΙ ΔΙΑΛΥΤΟΠΟΙΗΣΗΣ

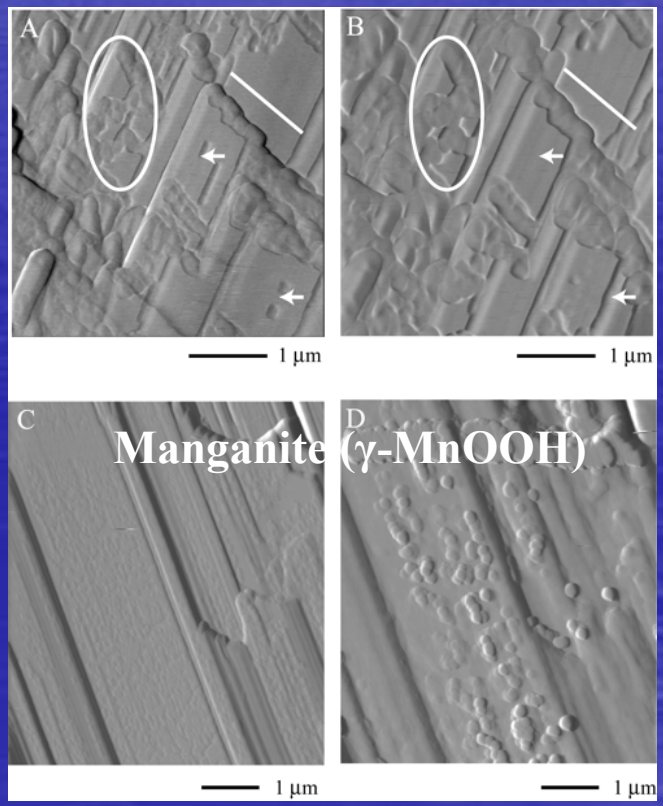




“ΜΙΚΡΟΣΚΟΠΙΚΟΙ” ΡΥΘΜΟΙ ΔΙΑΛΥΤΟΠΟΙΗΣΗΣ







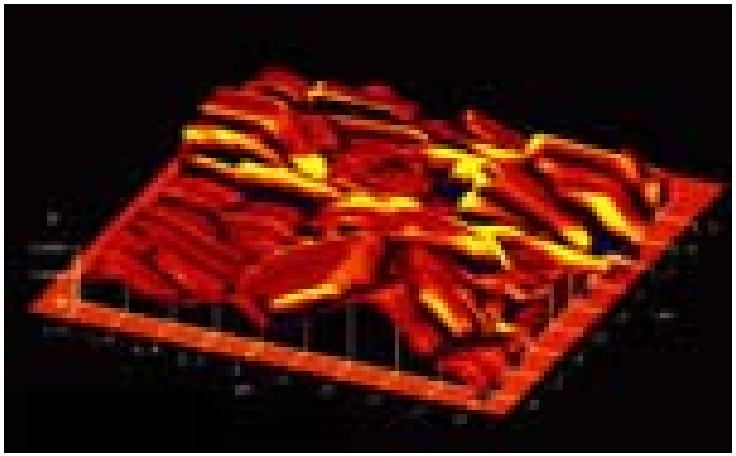
in-situ ΜΙΚΡΟΣΚΟΠΙΚΗ ΠΑΡΑΤΗΡΗΣΗ (nm/Å-κλίμακα)

ΓΥΨΟΠΟΙΗΣΗ ΜΑΡΜΑΡΟΥ

$$H^+(aq) + CaCO_3(s) \rightarrow Ca^{2+}(aq) + HCO_3^-(aq) \quad [1]$$

$$HCO_3^-(aq) + H^+(aq) \overset{K}{\rightleftharpoons} H_2CO_3(aq) \overset{k_h}{\rightarrow} CO_2(aq) + H_2O(l), \quad [2]$$

$$CaCO_3(s) + H_2SO_4(aq) + 2H_2O(l) \rightarrow CaSO_4 \cdot 2H_2O(s) + H_2CO_3(aq). \quad [3]$$



SOLUBILITIES OF METAL CARBONATES AND PHOSPHATES

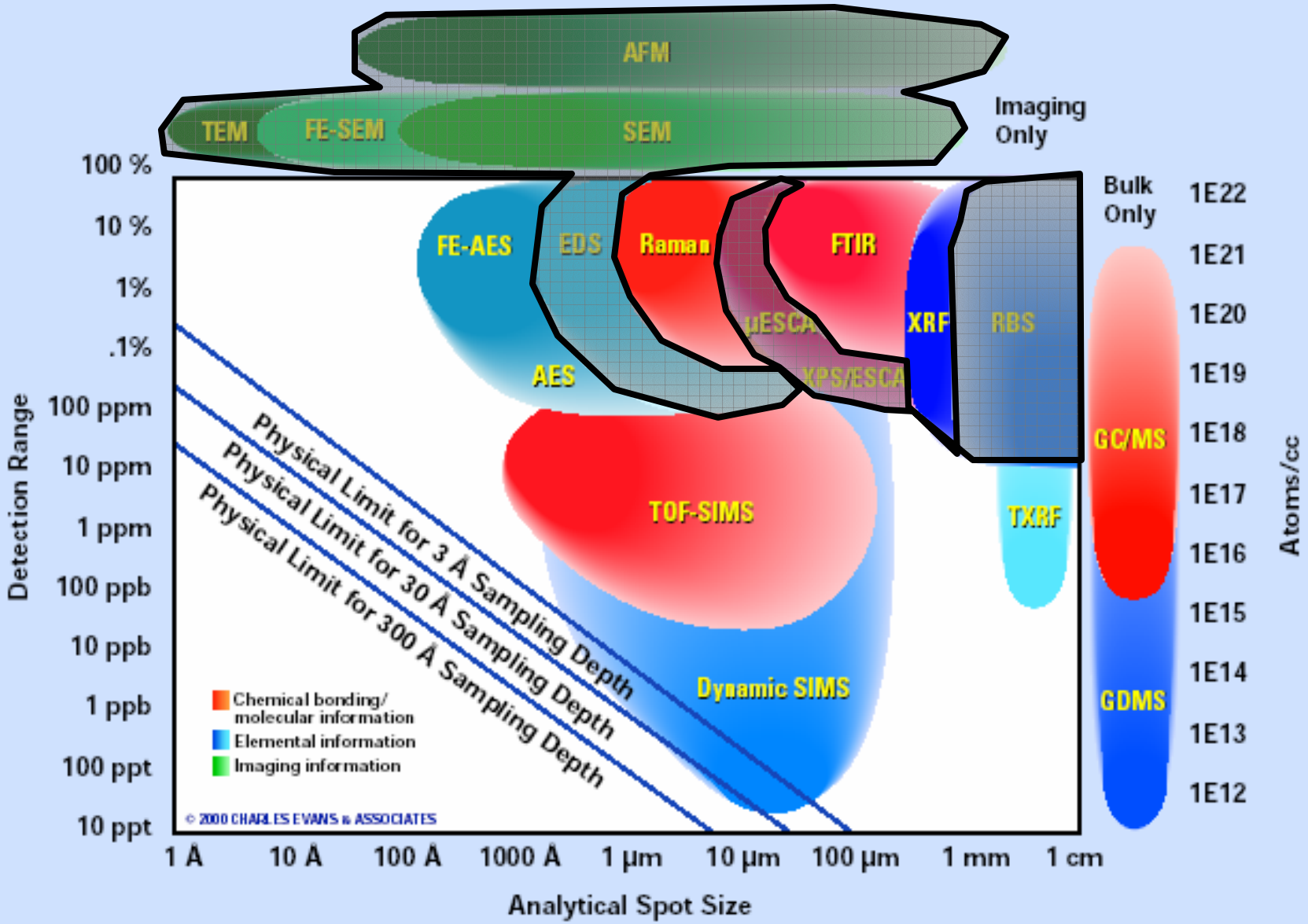
COMPOUND	MINERAL	LogK_{sp}	COMPOUND	MINERAL	LogK_{sp}
Li_2CO_3	Zabuyelite	-1.6	Li_3PO_4		-8.5
$MgCO_3$	Magnesite	-7.4	$PbHPO_4$		-15.6
$NiCO_3$		-8.1	$CaHPO_4.2H_2O$	Brushite	-18.9
$BaCO_3$	Witherite	-8.3	$CaHPO_4$	Monetite	-19.1
$CaCO_3$	Calcite	-8.5	$Mg_3(PO_4)_2$		-24.4
$CuCO_3$		-9.8	$LaPO_4.\chi H_2O$	Rhabdophane	-24.5
$SrCO_3$	Strontianite	-9.9	$LaPO_4$		-26.1
$FeCO_3$	Siderite	-10.5	$Zn_3(PO_4)_2$		-27.1
$MnCO_3$	Rodochrosite	-10.7	$Cd_3(PO_4)_2$		-32.6
$ZnCO_3$	Smithsonite	-10.8	$Ca_3(PO_4)_2$		-32.7
Ag_2CO_3		-11.0	$Cu_3(PO_4)_2$		-36.8
$CdCO_3$	Otavite	-11.3	$Ca_5(PO_4)_3OH$	Hydroxyapatite	-38.1
$CoCO_3$		-12.8	$Pb_3(PO_4)_2$		-44.4
$PbCO_3$	Cerussite	-13.1	$Ca_5(PO_4)_3Cl$	Chloroapatite	-46.9
$Zn_5(OH)_6(CO_3)_2$	Hydrozincite	-14.9	$Ca_5(PO_4)_3F$	Fluorapatite	-60.0
$La_2(CO_3)_3$		-29.9	$Sr_5(PO_4)_3OH$		-51.3
$Nd_2(CO_3)_3$		-31.3	$Pb_5(PO_4)_3OH$	Hydroxypyromorphite	-62.8
$Gd_2(CO_3)_3$		-35.4	$Pb_5(PO_4)_3Cl$	Chloropyromorphite	-84.4
$Pb_3(CO_3)_2(OH)_2$	Hydrocerussite	-43.7			

ΜΗ ΚΑΤΑΣΤΡΟΦΙΚΕΣ

(NONDESTRUCTIVE)

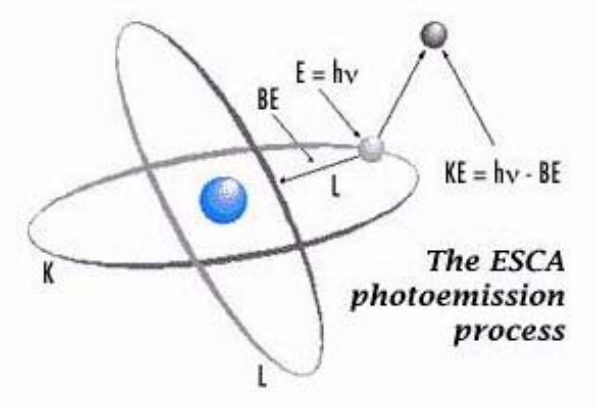
ΤΕΧΝΙΚΕΣ
ΕΠΙΦΑΝΕΙΑΚΗΣ ΑΝΑΛΥΣΗΣ

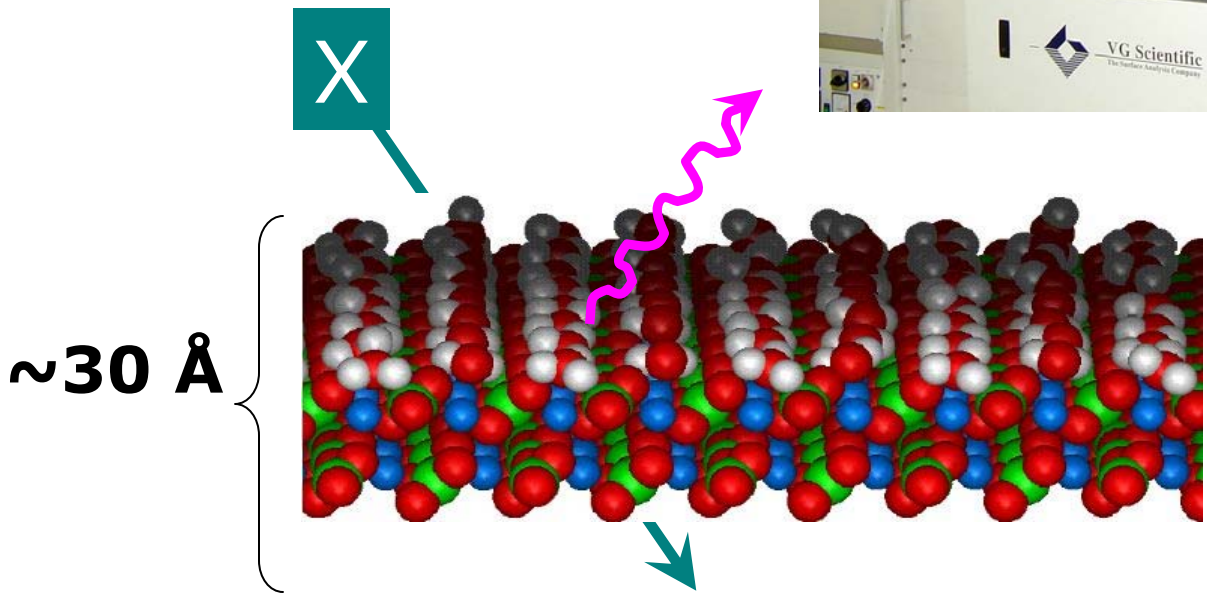
Analytical Resolution versus Detection Limit

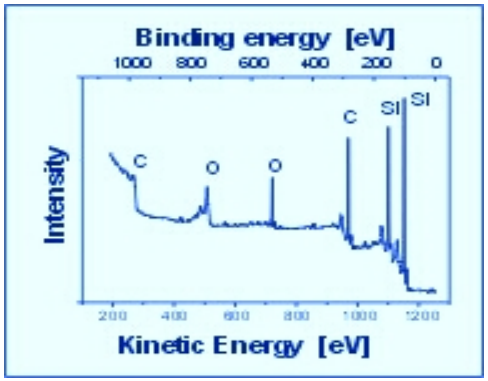


XPS (ESCA)

ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΦΩΤΟΗΛΕΚΤΡΟΝΙΩΝ ΜΕ ΑΚΤΙΝΕΣ-Χ

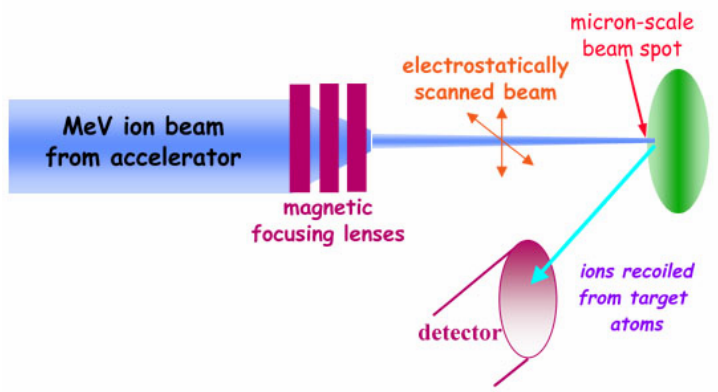


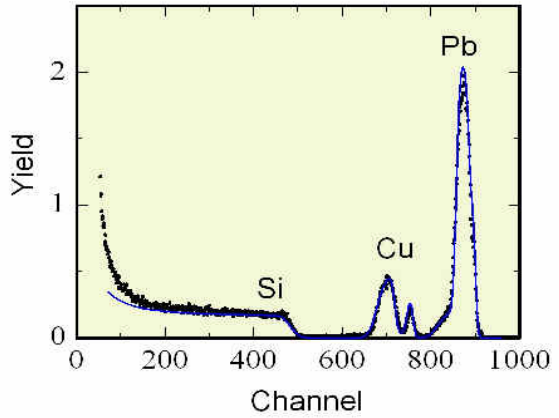




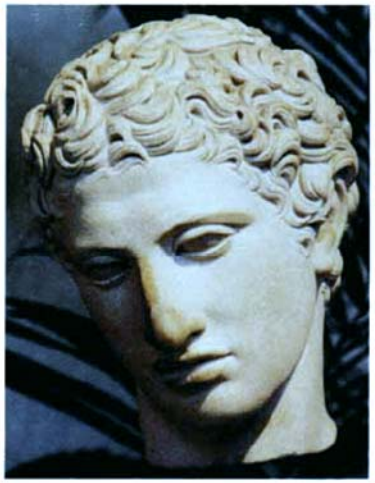
RBS

ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΟΠΙΣΘΟΣΚΕΔΑΖΟΜΕΝΩΝ ΣΩΜΑΤΙΔΙΩΝ ΚΑΤΑ Rutherford



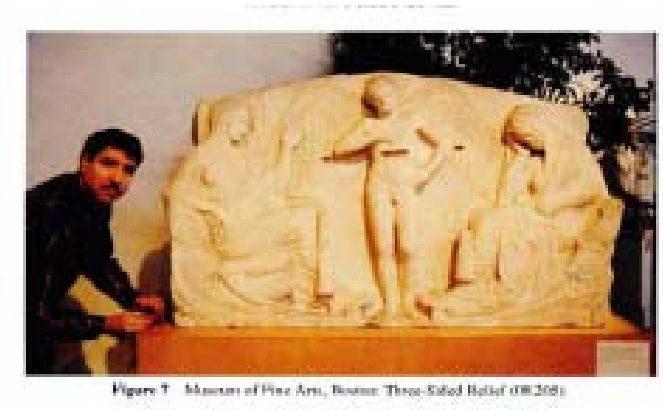


Thasian Marble



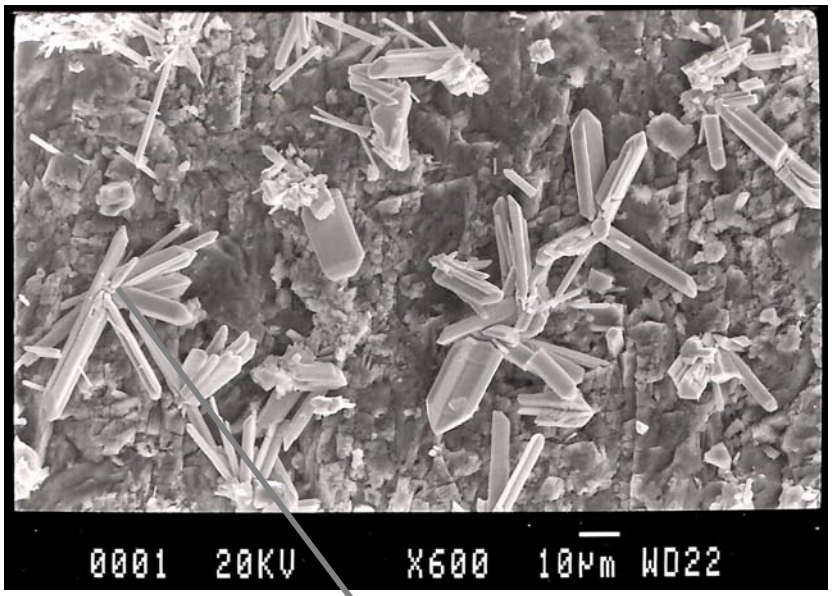
Pompeii

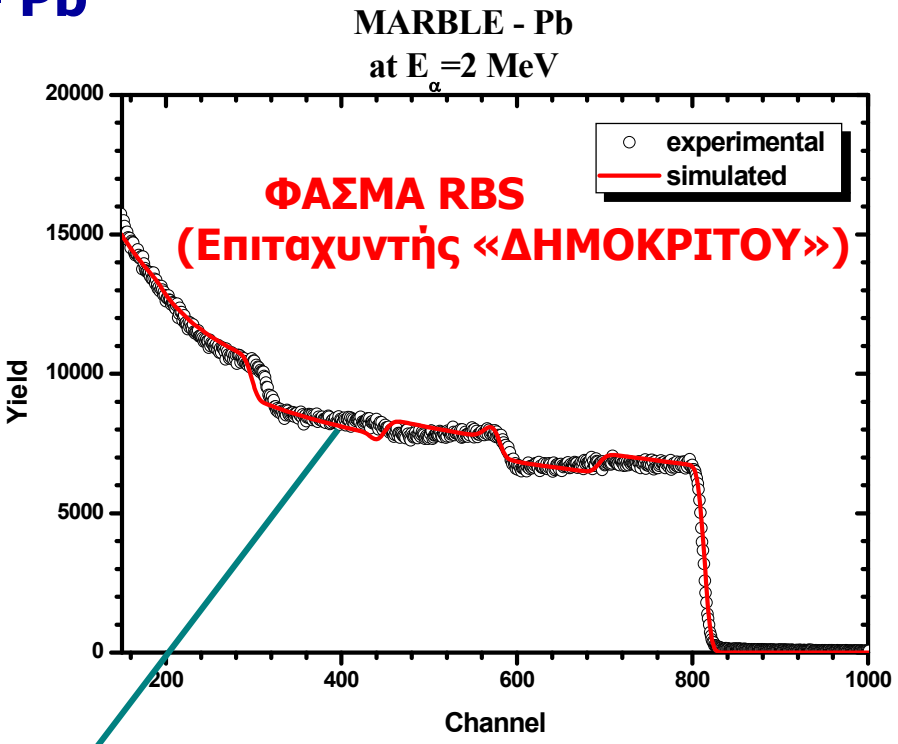
Roman, 190 AD

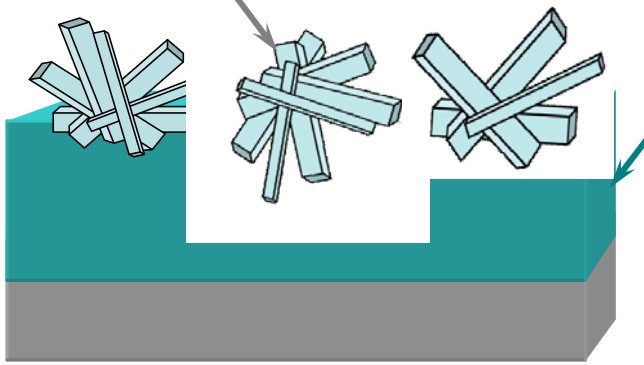


Αλληλεπίδραση της επιφάνειας μαρμάρων με βαρέα μέταλλα

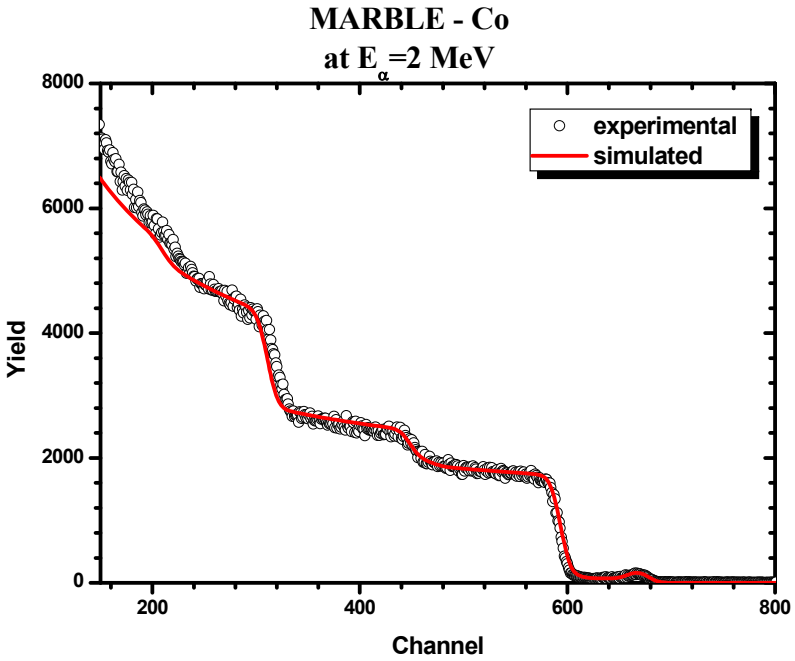
ΔΟΛΟΜΙΤΙΚΟ ΜΑΡΜΑΡΟ - Pb

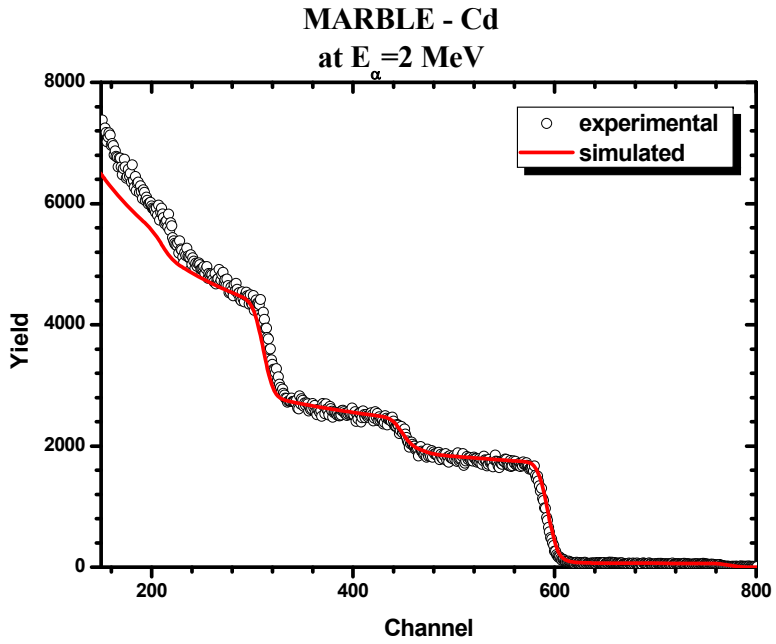






Pb^{2+} carbonate crystals overgrown on the Pb-bearing dissolved surface of marble



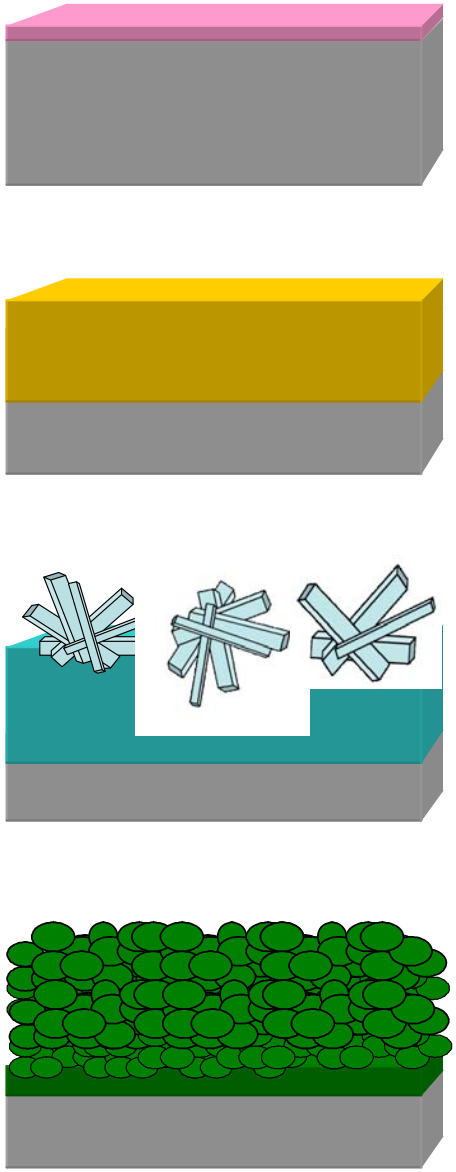


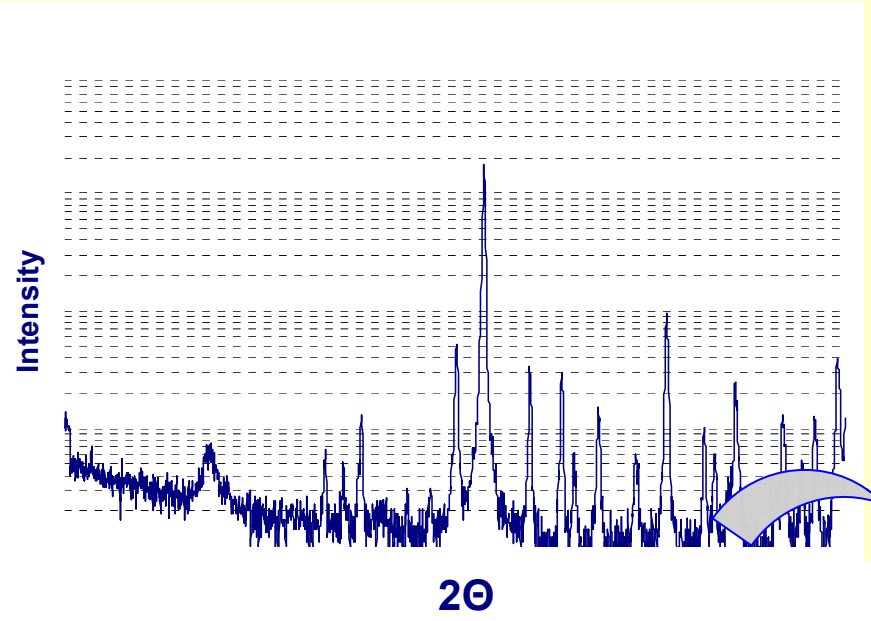
Co $^{2+}$

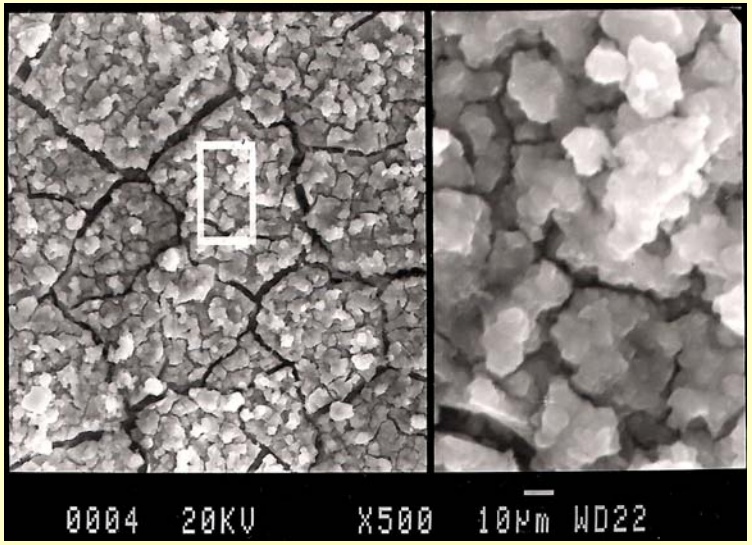
Cd $^{2+}$

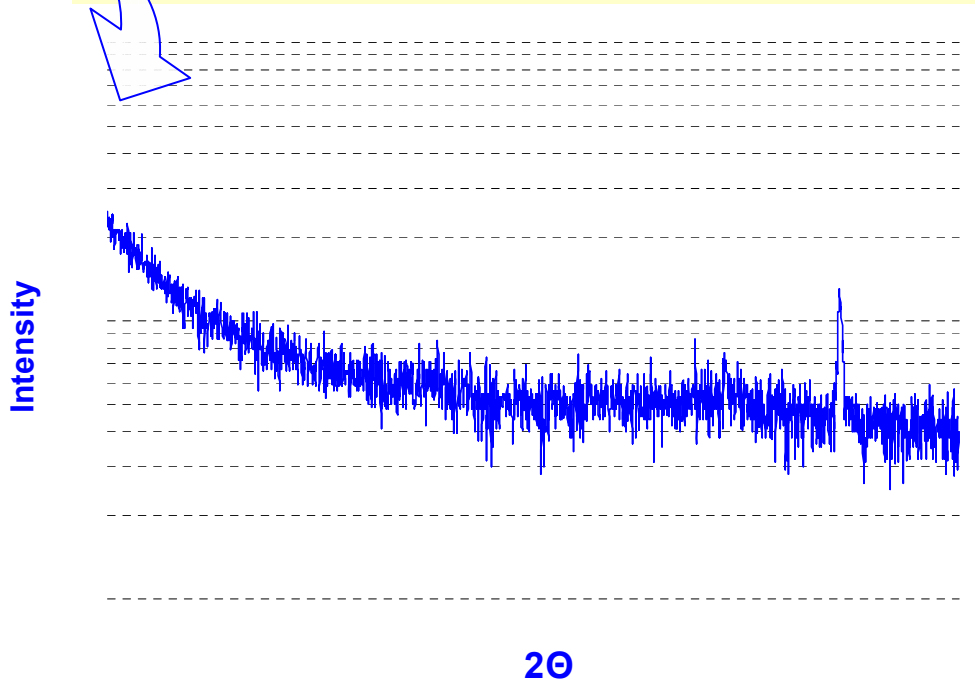
Pb $^{2+}$

Cr $^{3+}$









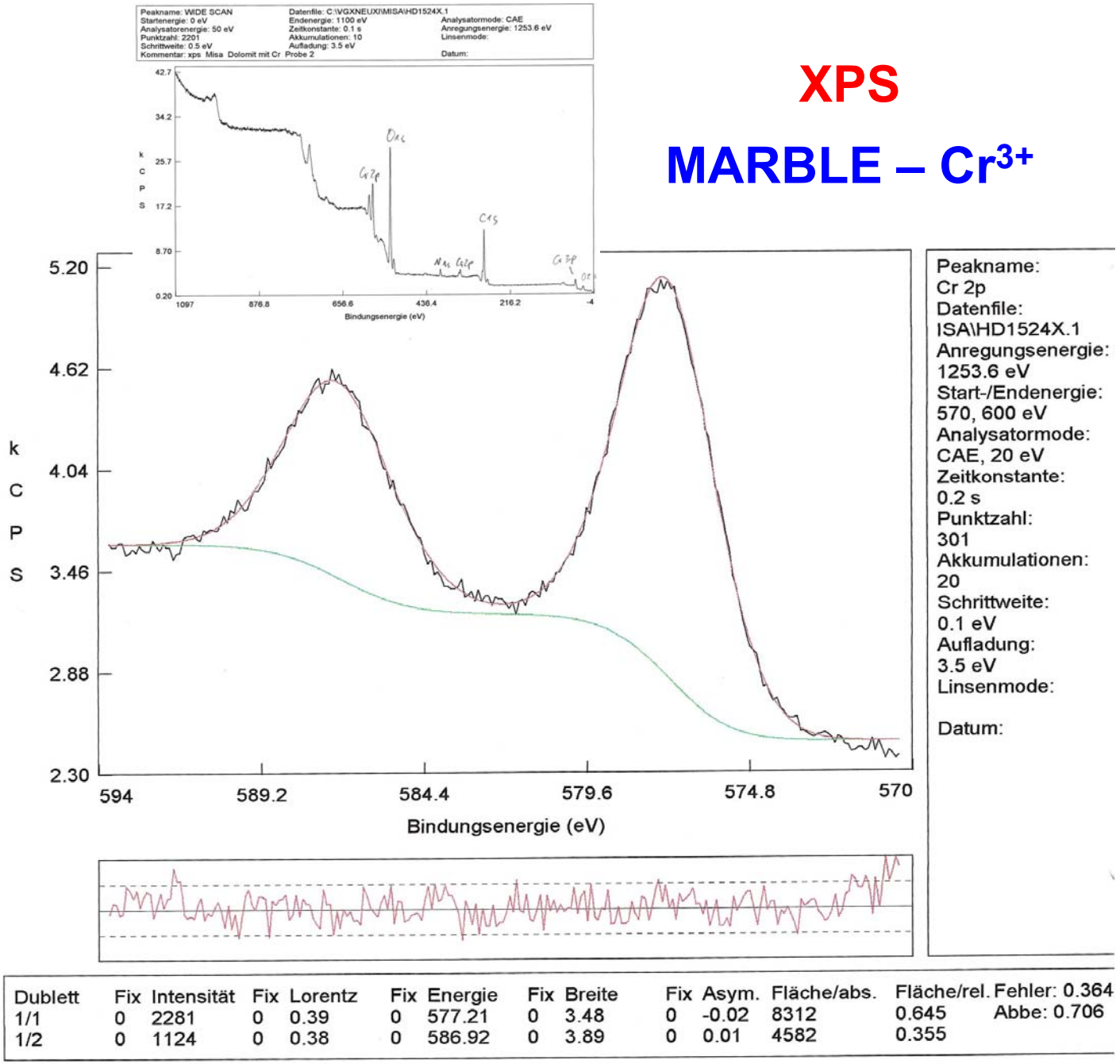
powder XRD

MARBLE - Cr^{3+}

Surface precipitation of *amorphous* Cr-compound

XPS

MARBLE – Cr^{3+}



COMPOUND	BE
Cr	574.4
Cr2O3	576.9
Cr	574.3
Cr	574.3
Cr2N	576.1
CrN	575.8
CrB2	574.3
Cr2S3	574.8
CrI3	576.7
CrBr3	576.2
CrCl3	577.4
Cr2O3	576.8
CrO2	576.3
CrO3	578.3
CrF3	580.3
CrO3	579.8
Cr(OH)3	**577.3**
CrOOH	**577.0**
Cr(CO)6	576.3
Cr(CO)6	577.0
K2Cr2O7	579.9
Na2CrO4	579.8
Na2CrO4	580.5
Na2Cr2O7	579.4
Na3CrO4	578.5
Na4CrO4	577.9
NaCrO2	577.1
ZnCr2O4	577.2
BaCrO4	579.1
CaCrO4	578.9
K3Cr(CN)6	576.3

ΦΑΣΜΑΤΟΣΚΟΠΙΚΕΣ ΤΕΧΝΙΚΕΣ ΕΡΕΥΝΑΣ ΔΟΜΙΚΩΝ ΛΙΘΩΝ

FTIR

ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΥΠΕΡΥΘΡΟΥ ΜΕ ΜΕΤΑΣΧΗΜΑΤΙΣΜΟ Fourier

EPR (ESR)

ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΗΛΕΚΤΡΟΝΙΚΟΥ ΠΑΡΑΜΑΓΝΗΤΙΚΟΥ ΣΥΝΤΟΝΙΣΜΟΥ

NMR

ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΠΥΡΗΝΙΚΟΥ ΜΑΓΝΗΤΙΚΟΥ ΣΥΝΤΟΝΙΣΜΟΥ

ΦΥΣΙΚΟΧΗΜΙΚΕΣ ΔΙΕΡΓΑΣΙΕΣ ΣΕ ΔΙΕΠΙΦΑΝΕΙΕΣ ΟΡΥΚΤΩΝ

- **ΟΡΥΚΤΟΓΕΝΕΣΗ**

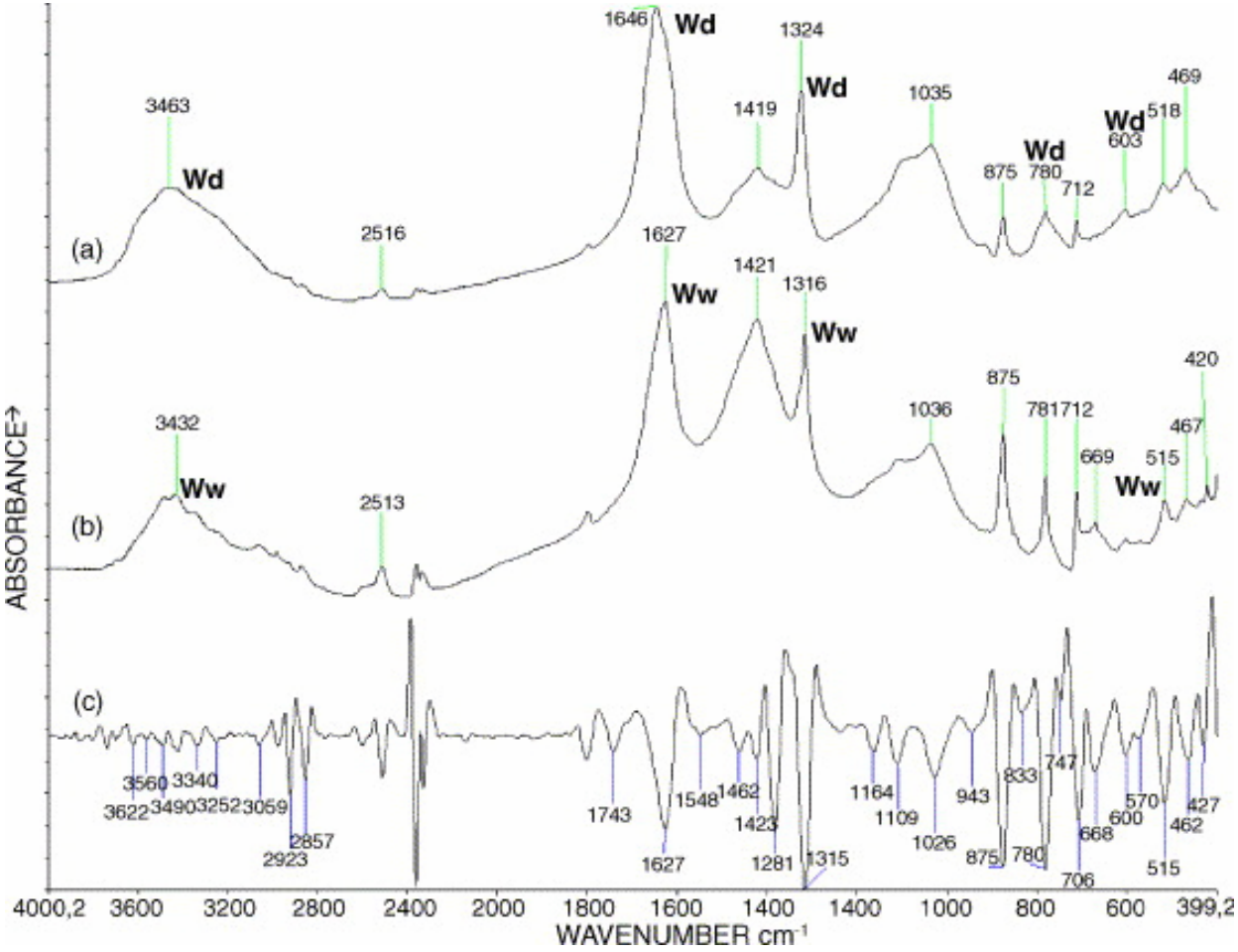
(ανάπτυξη κρυστάλλων μέσω ετερογενούς πυρήνωσης)

THAUMASITE
$Ca_3Si(CO_3)(SO_4)(OH)_6 \cdot 12(H_2O)$

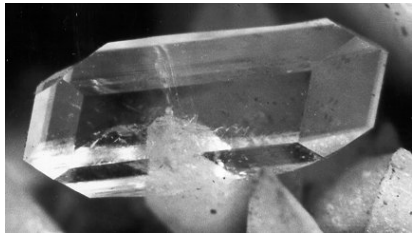
THENARDITE – MIRABILITE
$Na_2SO_4 \cdot xH_2O$

ΕΠΙΦΑΝΕΙΑΚΕΣ ΑΛΛΟΙΩΣΕΙΣ ΜΑΡΜΑΡΩΝ ΠΑΡΘΕΝΩΝΑ

FTIR



Whewellite
$CaC_2O_4 \cdot H_2O$



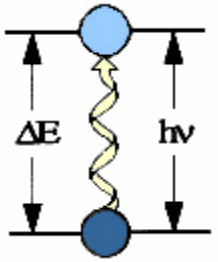
Weddellite
$CaC_2O_4 \cdot 2H_2O$

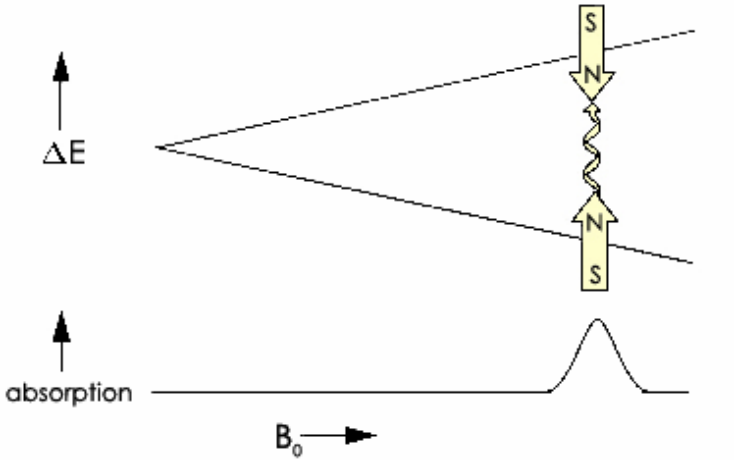
EPR (ESR)

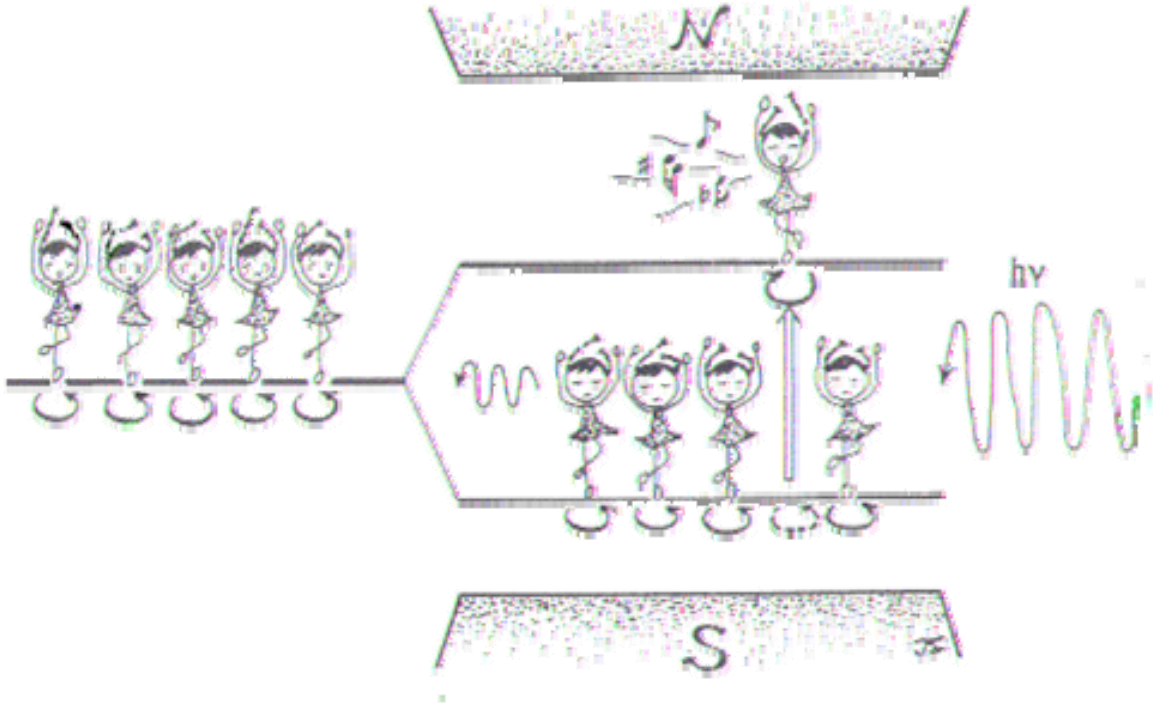
ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΗΛΕΚΤΡΟΝΙΚΟΥ ΠΑΡΑΜΑΓΝΗΤΙΚΟΥ ΣΥΝΤΟΝΙΣΜΟΥ

Evgeny Zavoisky
KAZAN UNIVERSITY
1945

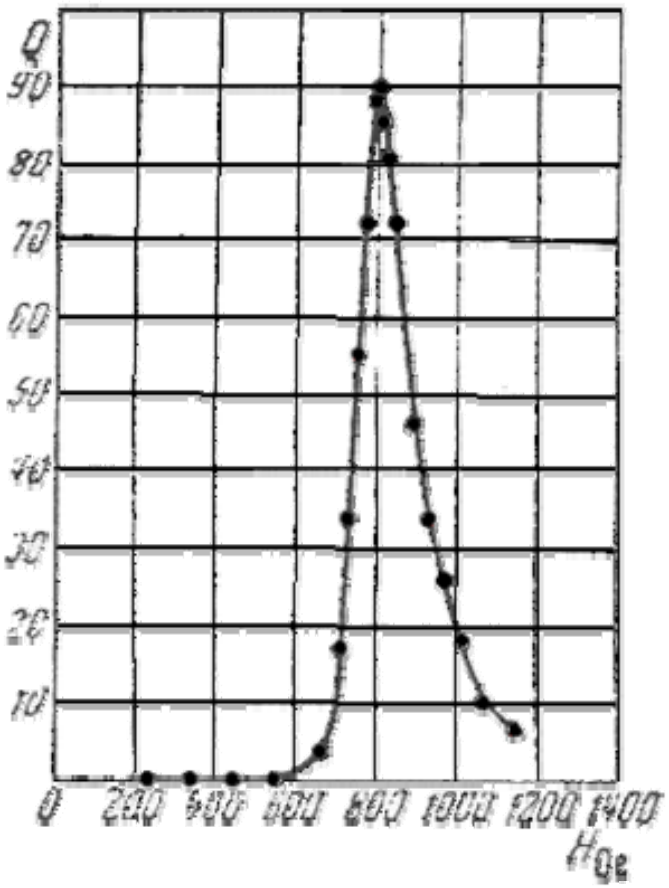
The principle of EPR. The unpaired electrons are excited to a high energy state under the magnetic field by the absorption of microwave "music." The excited electron changes its direction of spin and relaxes into the ground state by emitting phonons (song). Microwave absorption is measured as a function of the magnetic field by EPR spectroscopy.

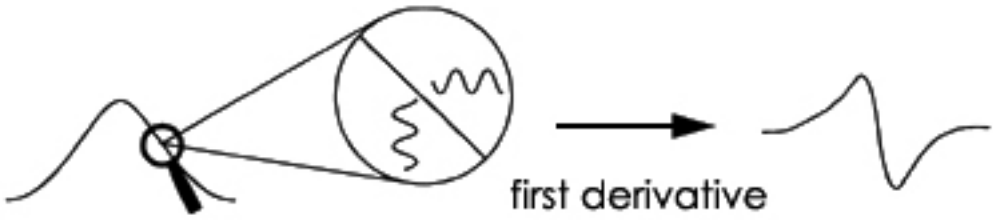


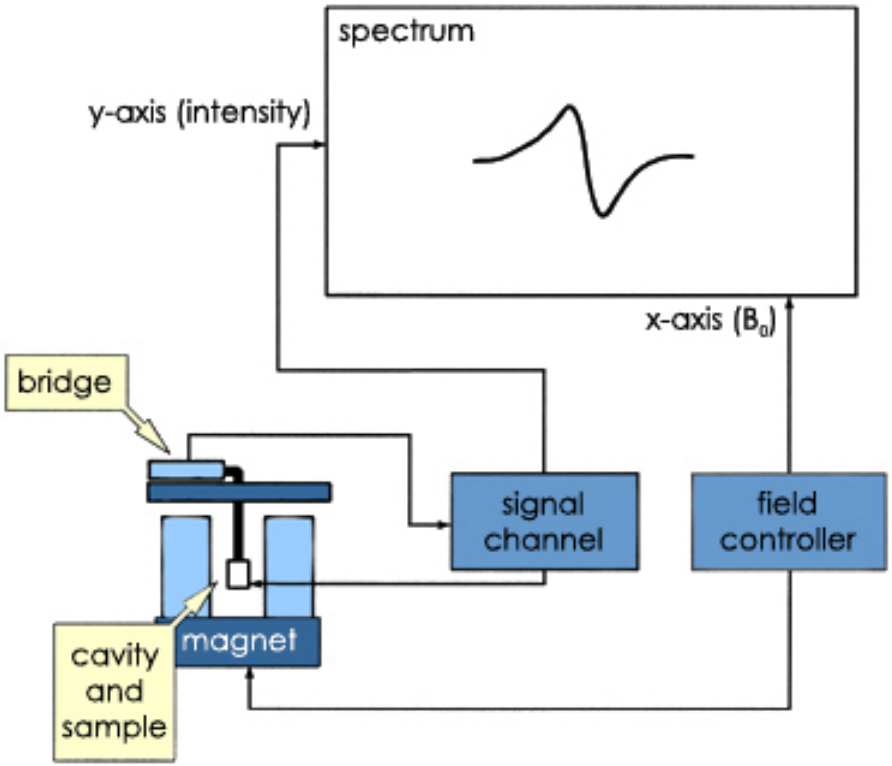


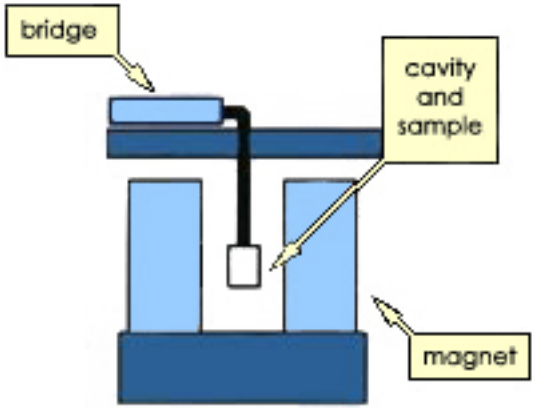


$CuCl_2.2H_2O$
4.76mT 133MHz

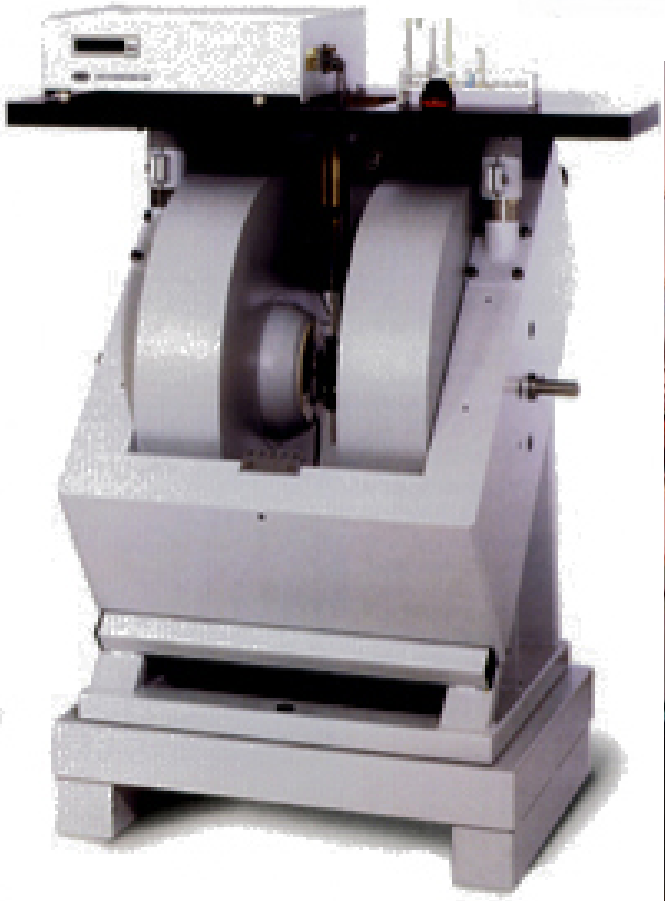


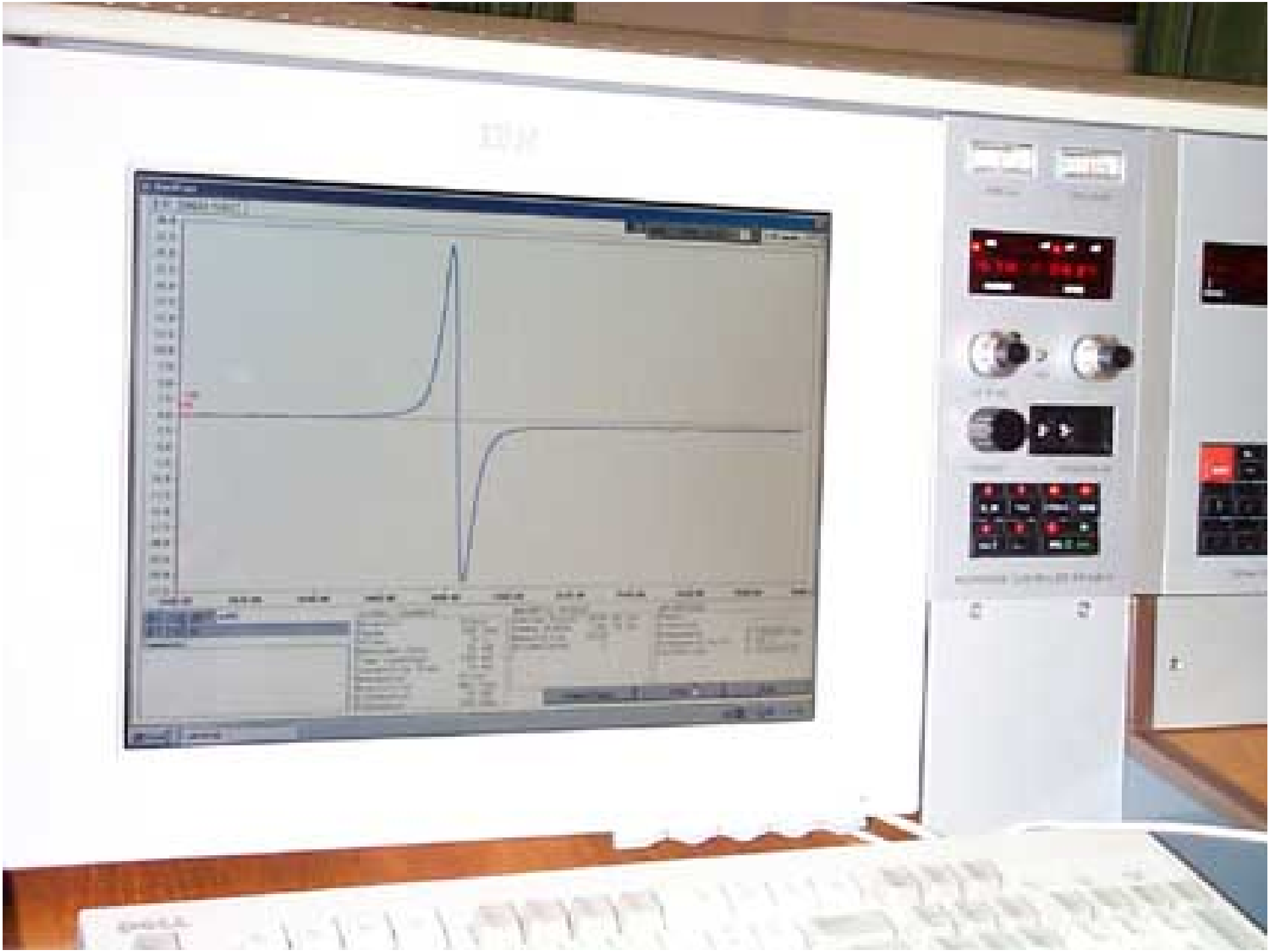





bridge
cavity and sample
magnet


console
BRUKER
EMX

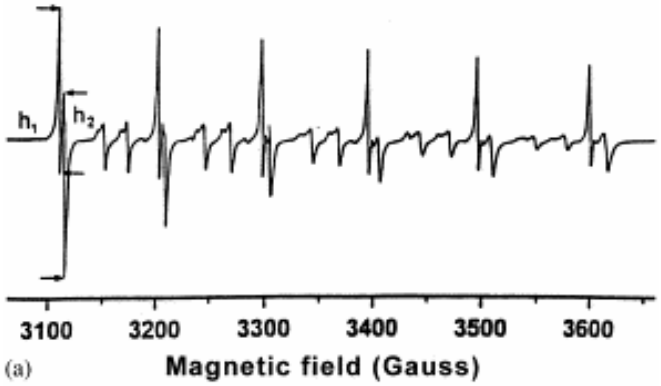




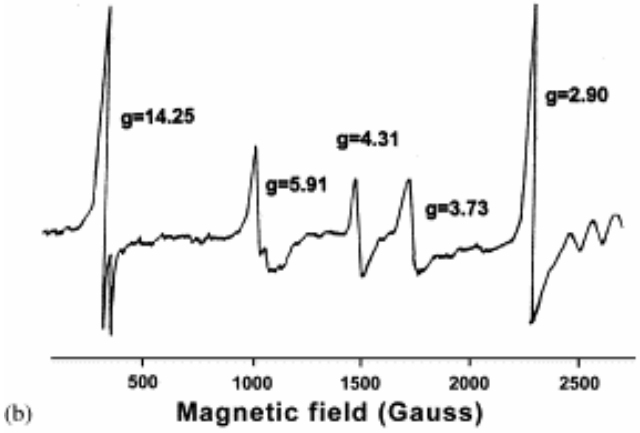
Ions	Spin direction of 3*d* orbitals	# electrons	Mag. Moment
Ti^{3+} , V^{4+}		1	1 μ_B
Ti^{2+} , V^{3+}		2	2 μ_B
V^{2+}, Cr^{3+}, Mn^{4+}		3	3 μ_B
Cr^{2+} , Mn^{3+}		4	4 μ_B
Mn^{2+}, Fe^{3+}		5	5 μ_B
Fe^{2+}, Co^{3+}		6	4 μ_B
Co^{2+}		7	3 μ_B
Ni^{2+}		8	2 μ_B
Cu^{2+}		9	1 μ_B
Zn^{2+}, Cu^{+}		10	0 μ_B

ΦΑΣΜΑΤΟΣΚΟΠΙΑ
EPR
ΣΕ ΕΛΛΗΝΙΚΑ
ΔΙΑΒΡΩΜΕΝΑ ΜΑΡΜΑΡΑ

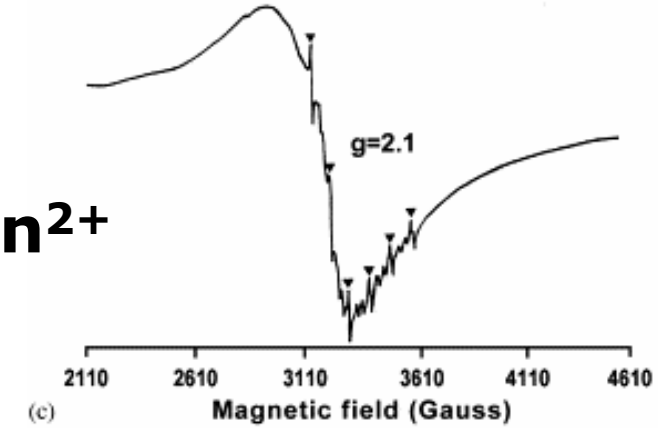
Mn^{2+}

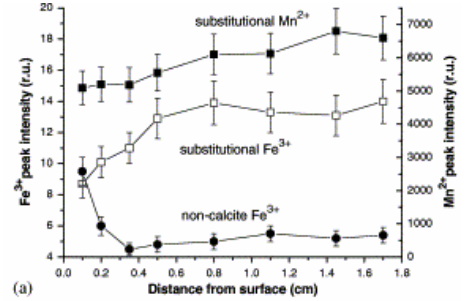


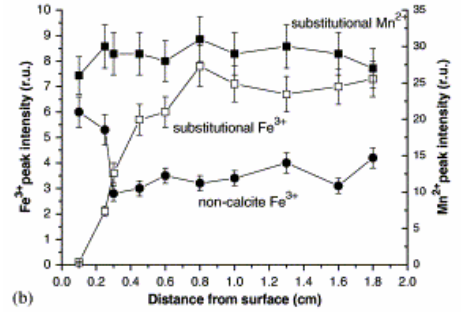
Fe^{3+}

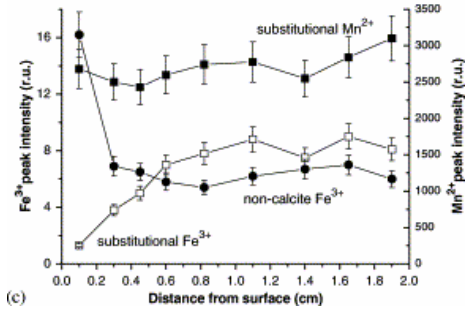


Fe^{3+} – Mn^{2+}

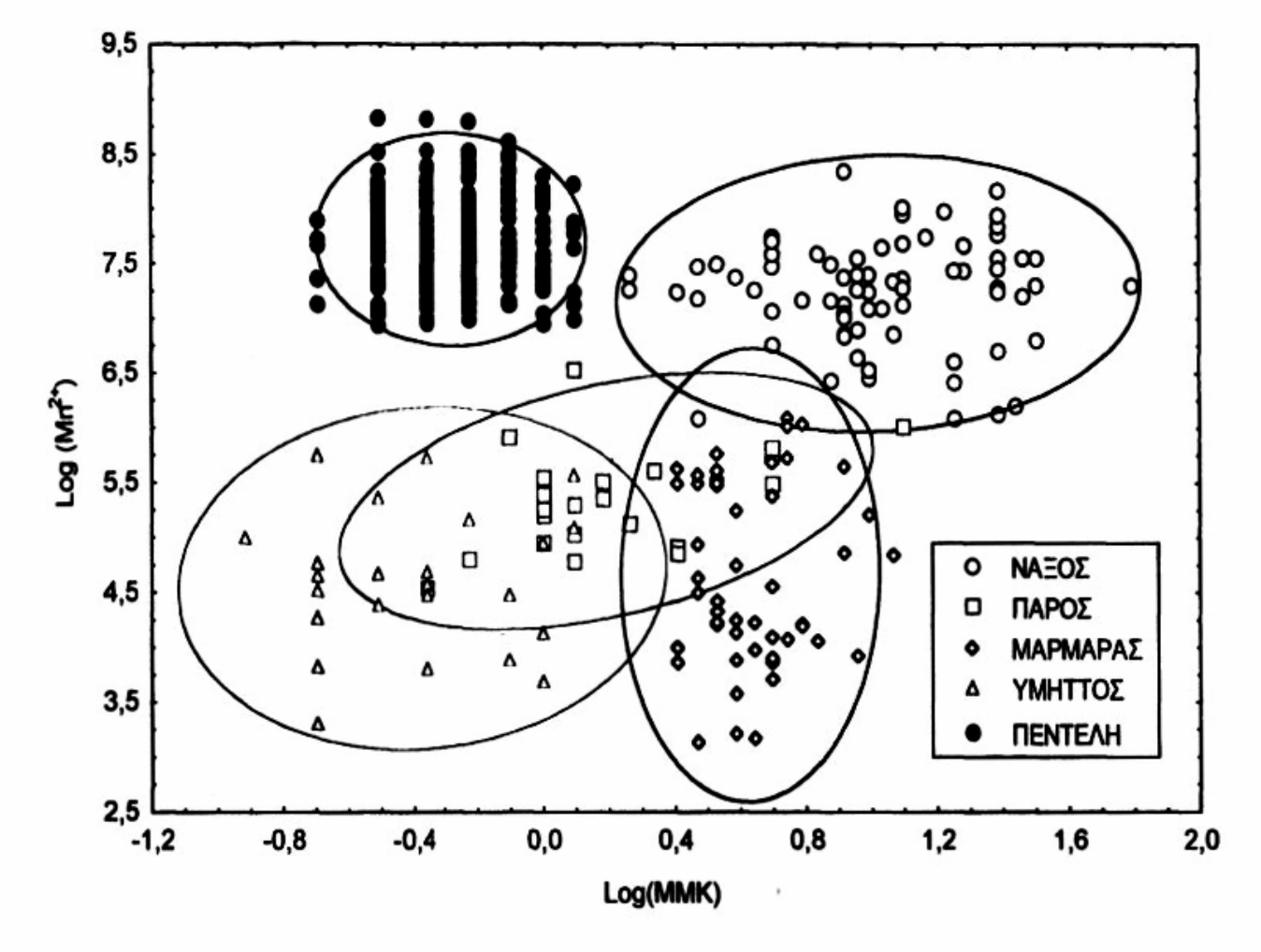








ΔΙΑΓΡΑΜΜΑ **EPR**
ΓΙΑ ΤΟΝ ΕΝΤΟΠΙΣΜΟ ΤΩΝ ΛΑΤΟΜΕΙΩΝ ΠΡΟΕΛΕΥΣΗΣ



ASMOSIA

Association for the Study of Marble & Other Stones In Antiquity

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- Conferences
- Proceedings
- Instructions for Authors
- Newsletters
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- Become a Member
- ASMOSIA Officers
- ASMOSIA By-Laws

Welcome To Our Organization

Founded in 1988

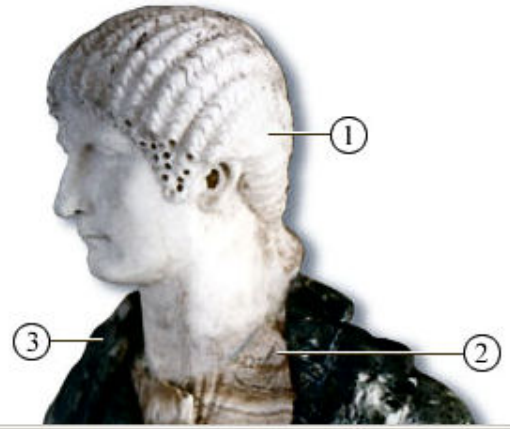
ASMOSIA's mission is to promote the exchange of knowledge among its members in all fields related to the study of marble and other stones of art historical or archaeological interest. This exchange is accomplished through periodic Newsletters to members, biannual meetings of the membership, and publication of the meeting proceedings.

| 07.07.2006 |

Agrippina the Younger

A symbol of our mission

The life-size bust, shown at the right, is of Agrippina the Younger (AD 15-59) and is symbolic of ASMOSIA's mission with its inclusion of both white and colored stones from different periods and localities. It includes: (1) *marmo pario*, the Roman *lychnites*, for the head (marble from the Island of Paros in the Cyclades of the central Aegean Sea, Greece); (2) *alabastro Egiziano* or *cotognino*, the Roman *lapis alabastrites* or *lapis onyx*, for the tunic (banded travertine from the middle Nile Valley, Egypt); and (3) *verde antico*, the Roman *marmor thessalicum*, for the drapery (brecciated ophicalcite serpentinite from near Larisa in Thessaly, northern Greece). The head



NMR

ΦΑΣΜΑΤΟΣΚΟΠΙΑ ΠΥΡΗΝΙΚΟΥ ΜΑΓΝΗΤΙΚΟΥ ΣΥΝΤΟΝΙΣΜΟΥ

Πυρήνες ατόμων με περιττό αριθμό πρωτονίων (^{1}H, ^{19}F, ^{13}C, ^{27}Al, ^{31}P, ^{29}Si, κ.ά) λόγω του spin και του φορτίου τους παρουσιάζουν διότητες μικροσκοπικού μαγνήτη με ορισμένη *μαγνητική ροπή* (ΜΑΓΝΗΤΙΚΑ ΔΙΠΟΛΑ)
Όταν οι πυρήνες/μαγνητικά δίπολα βρεθούν σε ομογενές μαγνητικό πεδίο είναι δυνατόν να προσανατολισθούν παράλληλα ή αντιπαράλληλα

$$E_2 - E_1 = \Delta E = h\nu = h\,\gamma H/2\pi$$

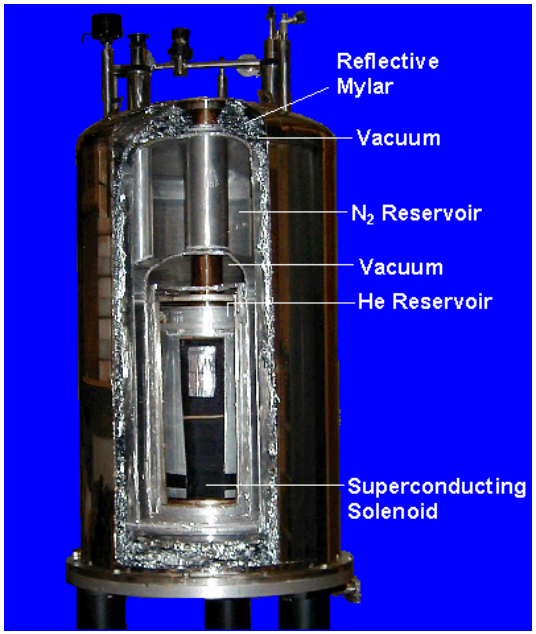
(γ = γυρομαγνητικός συντελεστής)

ΜΕΤΑΠΤΩΣΗ

$\nu = \gamma H/2\pi$ → Περιοχή ραδιοκυμάτων

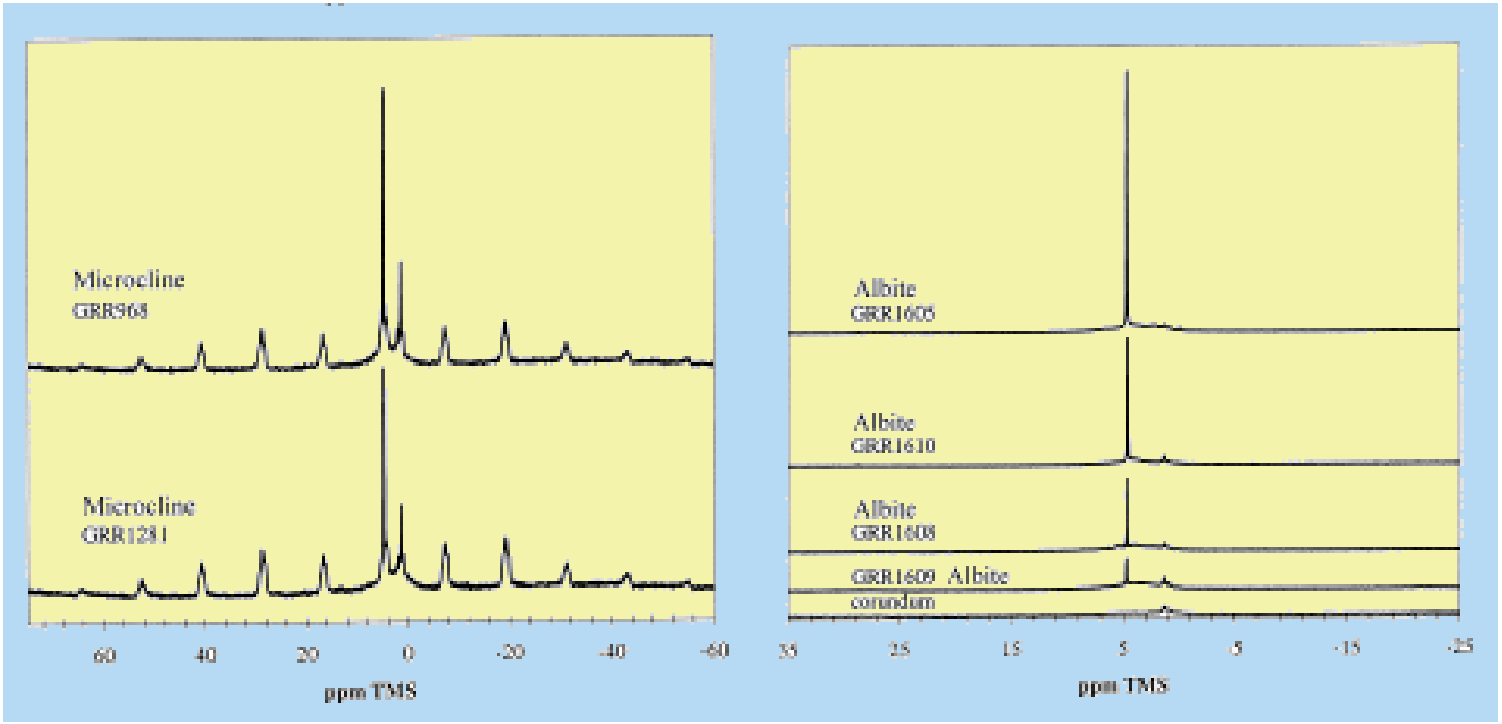
ΔΙΑΤΗΡΟΥΜΕ ΣΤΑΘΕΡΟ ΤΟ ν ΚΑΙ ΜΕΤΑΒΑΛΟΥΜΕ ΤΟ Η
ν = Η : **ΠΥΡΗΝΙΚΟΣ ΜΑΓΝΗΤΙΚΟΣ ΣΥΝΤΟΝΙΣΜΟΣ**

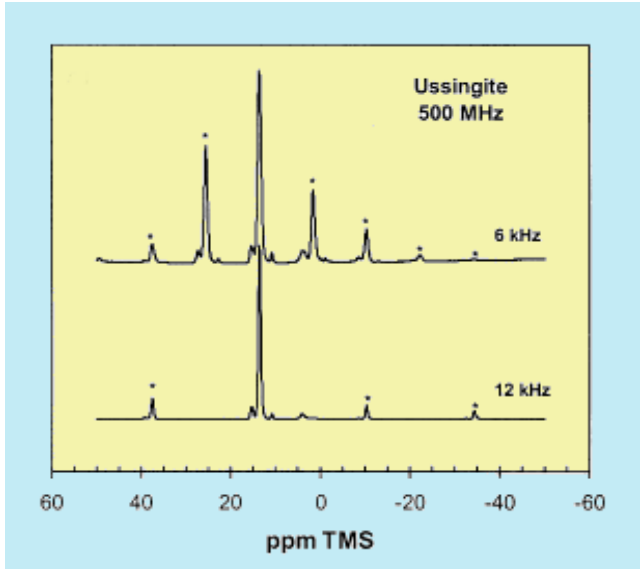

300


Reflective Mylar
Vacuum
N_2 Reservoir
Vacuum
He Reservoir
Superconducting Solenoid


BRUKER

^{1}H NMR





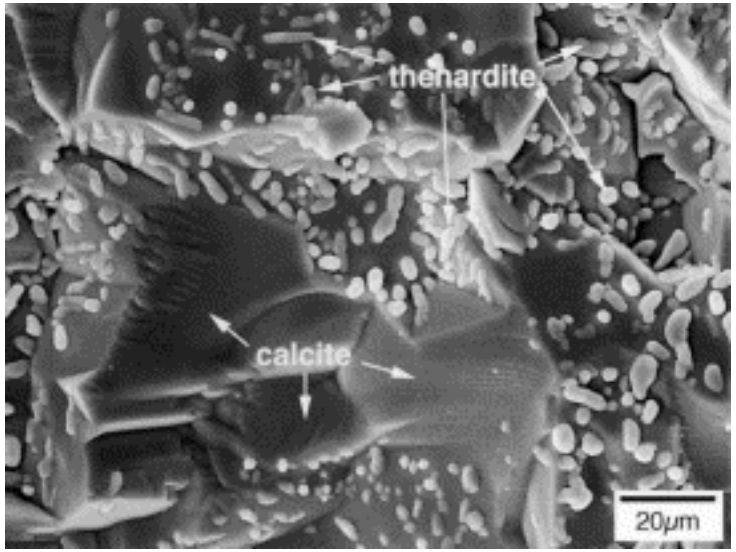
$Na_2AlSi_3O_8(OH)$

ΦΑΣΜΑΤΟΜΕΤΡΟ NMR ΓΙΑ ΜΕΛΕΤΗ ΔΟΜΙΚΩΝ ΛΙΘΩΝ

NMR

THENARDITE – MIRABILITE

$Na_2SO_4 \cdot xH_2O$



EUROPA - Research - FP6 - Countering erosion in Europe's historic buildings - Microsoft Internet Explorer

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Address http://europa.eu.int/comm/research/fp6/ssp/saltcontrol_en.htm

RESEARCH

Important legal notice

English

EUROPA > European Commission > Research > FP6 > SSP > SALTCONTROL

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Scientific Support to Policies

SSP Homepage

Cultural heritage - Conserving our common legato

SALTCONTROL — Countering erosion in Europe's historic buildings

"Developing a new way of dealing with salt damage in Europe's culturally important buildings."

OVERVIEW:

SALTCONTROL aims to develop a new method to prevent salt damage by using compounds that inhibit the growth of salt crystals.

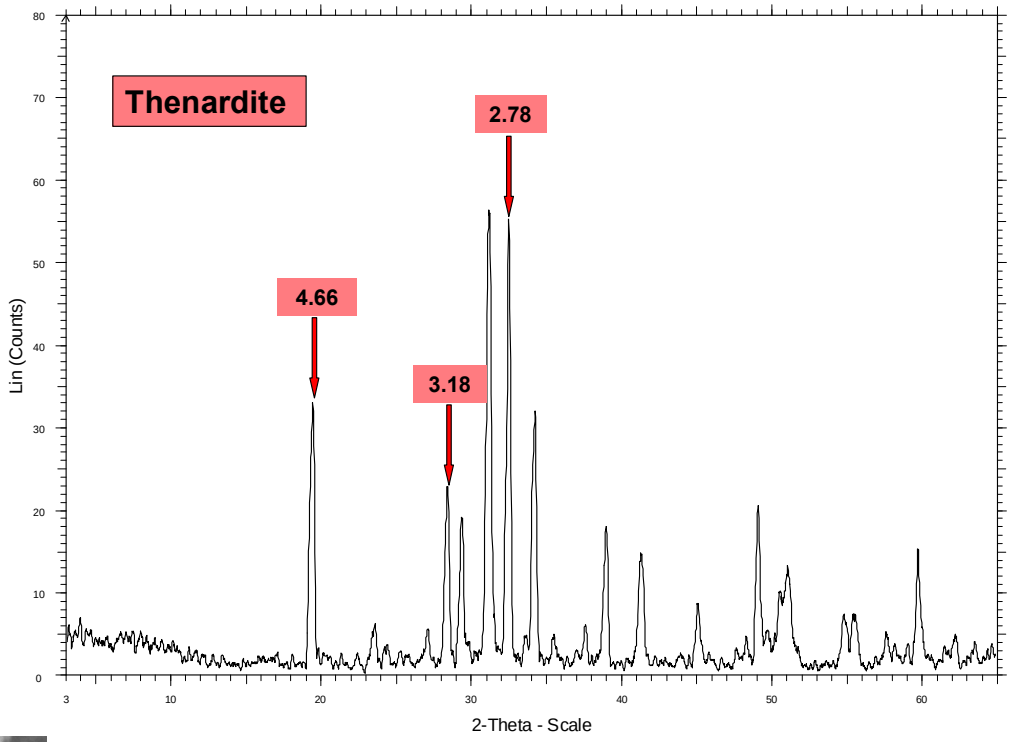
- Applying inhibitors will prevent salt crystallisation in stone pores – salts form instead on the surface causing much less damage
- The project will evaluate these inhibitors in different ways – from atomic scale studies to larger-scale tests and site trials

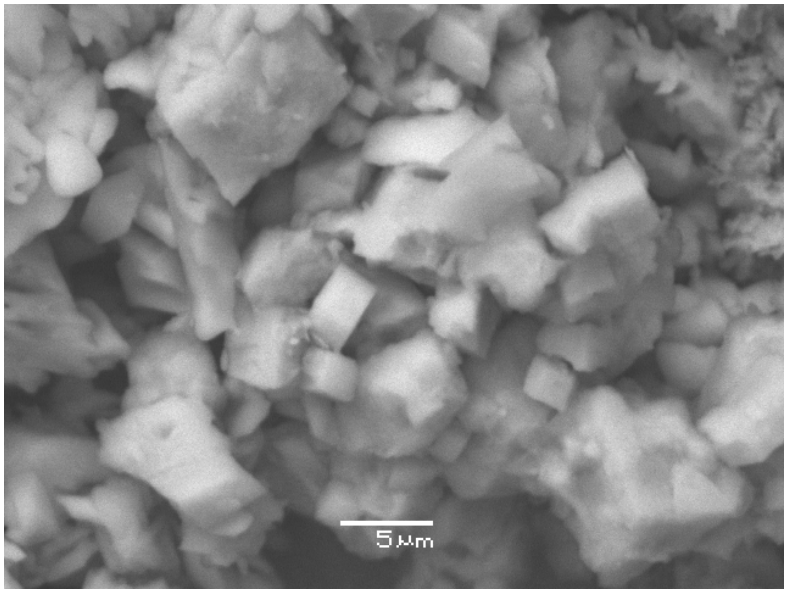
The problem

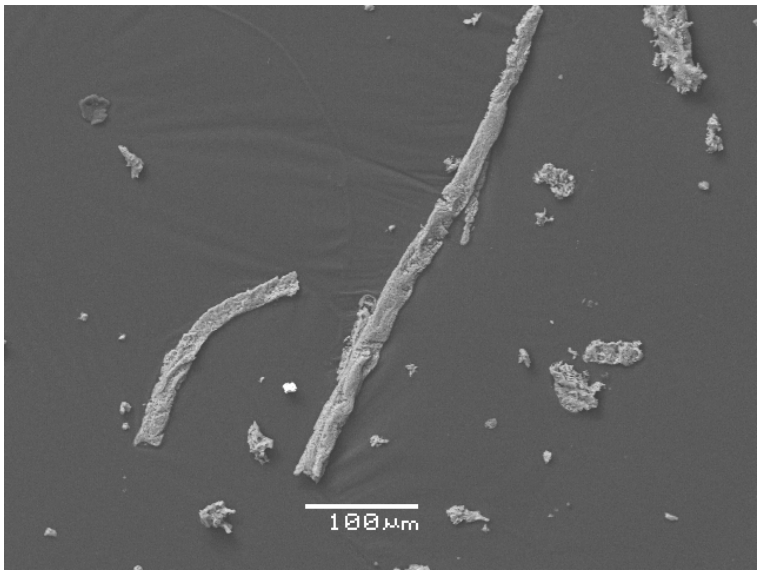
Salt weathering causes decay and damage to a

Internet

Start EUROPA - Research - FP... EN 4:59 πμ


Thenardite
4.66
3.18
2.78
Lin (Counts)
2-Theta - Scale
0
10
20
30
40
50
60
70
80
3
10
20
30
40
50
60

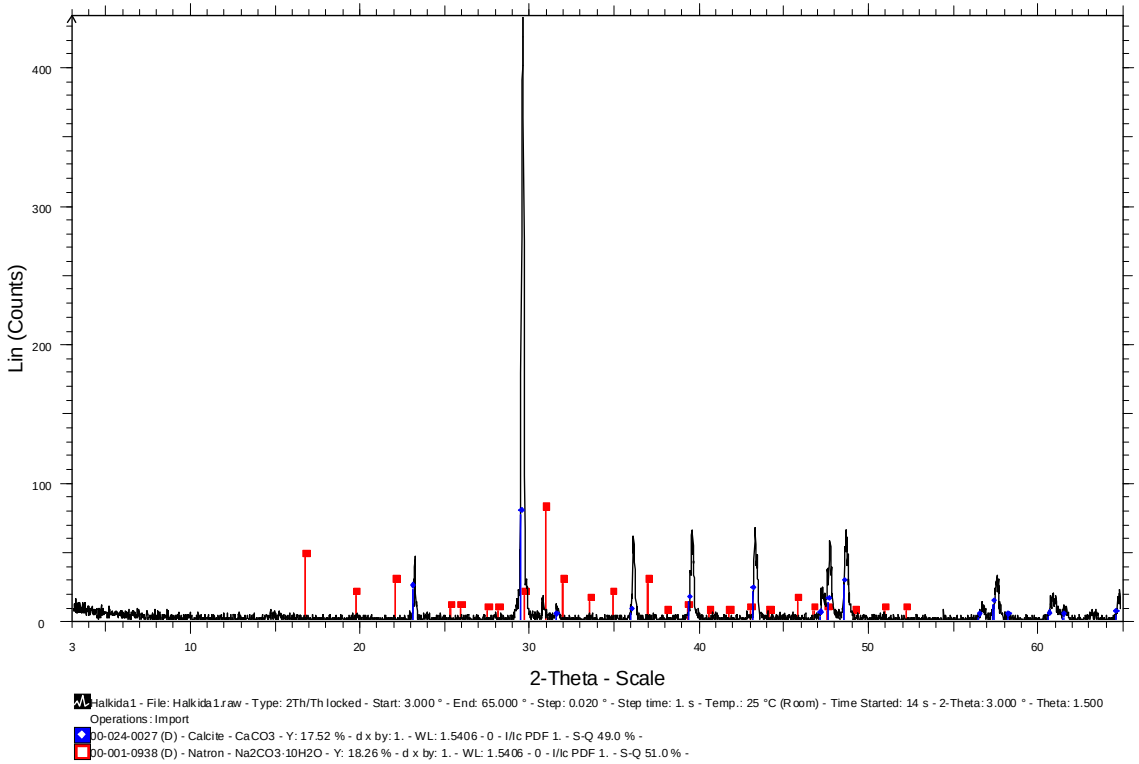

5 µm


100 µm

http://www.in.gr

ΙΑΝΟΥΑΡΙΟΣ 2007

Απαραίτητες κρίθηκαν από το υπουργείο Πολιτισμού οι εργασίες συντήρησης του μνημείου του Αγνωστου Στρατιώτη, που φιλοτέχνησε ο Φωκίωνας Ρωκ το 1931-32. Ήδη, έχει χάσει οριστικά το χέρι και το πέλμα του, ενώ φέρει πολλές πληγές, που έχουν προκαλέσει τόσο τα περιστέρια, το καυσαέριο, το νερό -αφού πλένεται τακτικά από τον Δήμο Αθηναίων- αλλά και η ετερογένεια του ίδιου του υλικού κατασκευής του (**ασβεστόλιθος**). Προκειμένου να σωθεί το μνημείο, θα τοποθετηθεί σκαλωσιά ώστε να κλείσουν οι ρωγμές, να συγκολληθούν τα θραύσματα που λείπουν, να διορθωθούν οι ατεχνίες από προηγούμενες επεμβάσεις και οι διχρωμίες και να καθαριστεί με κομπρέσες απιονισμένου νερού. Τα τμήματα που λείπουν θα συμπληρωθούν με τεχνητό λίθο.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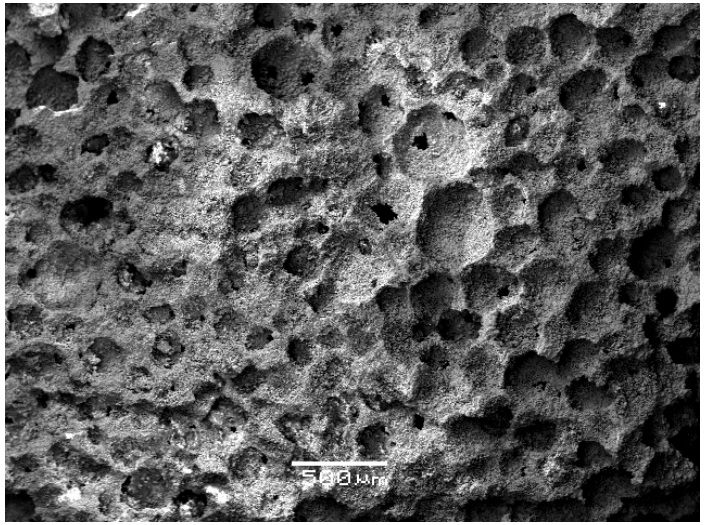
300
200
100
0
3
10
20
30
40
50
60
2-Theta - Scale
Halkida1 - File: Halkida1.raw - Type: 2Th/Th locked - Start: 3.000 ° - End: 65.000 ° - Step: 0.020 ° - Step time: 1. s - Temp.: 25 °C (Room) - Time Started: 14 s - 2-Theta: 3.000 ° - Theta: 1.500
Operations: Import
00-024-0027 (D) - Calcite - CaCO3 - Y: 17.52 % - d x by: 1. - WL: 1.5406 - 0 - I/Ic PDF 1. - S-Q 49.0 % -
00-001-0938 (D) - Natron - Na2CO3·10H2O - Y: 18.26 % - d x by: 1. - WL: 1.5406 - 0 - I/Ic PDF 1. - S-Q 51.0 % -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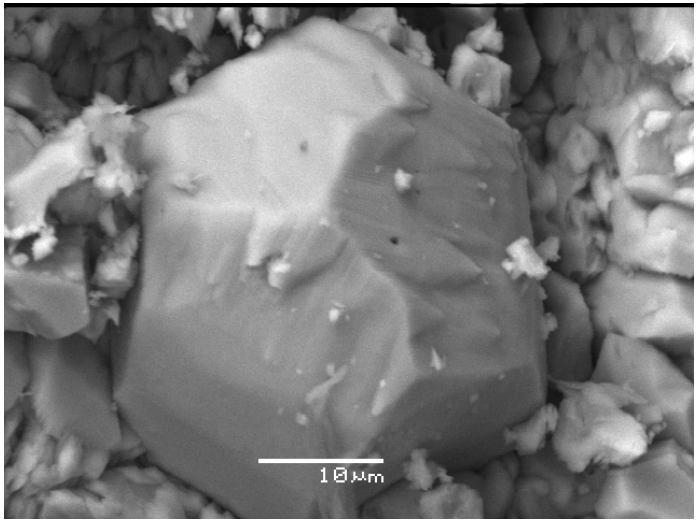
10 µm

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ΑΠΡΙΛΙΟΣ
2006

Με απόφαση του ΚΑΣ

Αναβάλλεται η σωστική επέμβαση στο αρχαίο θέατρο της Δωδώνης

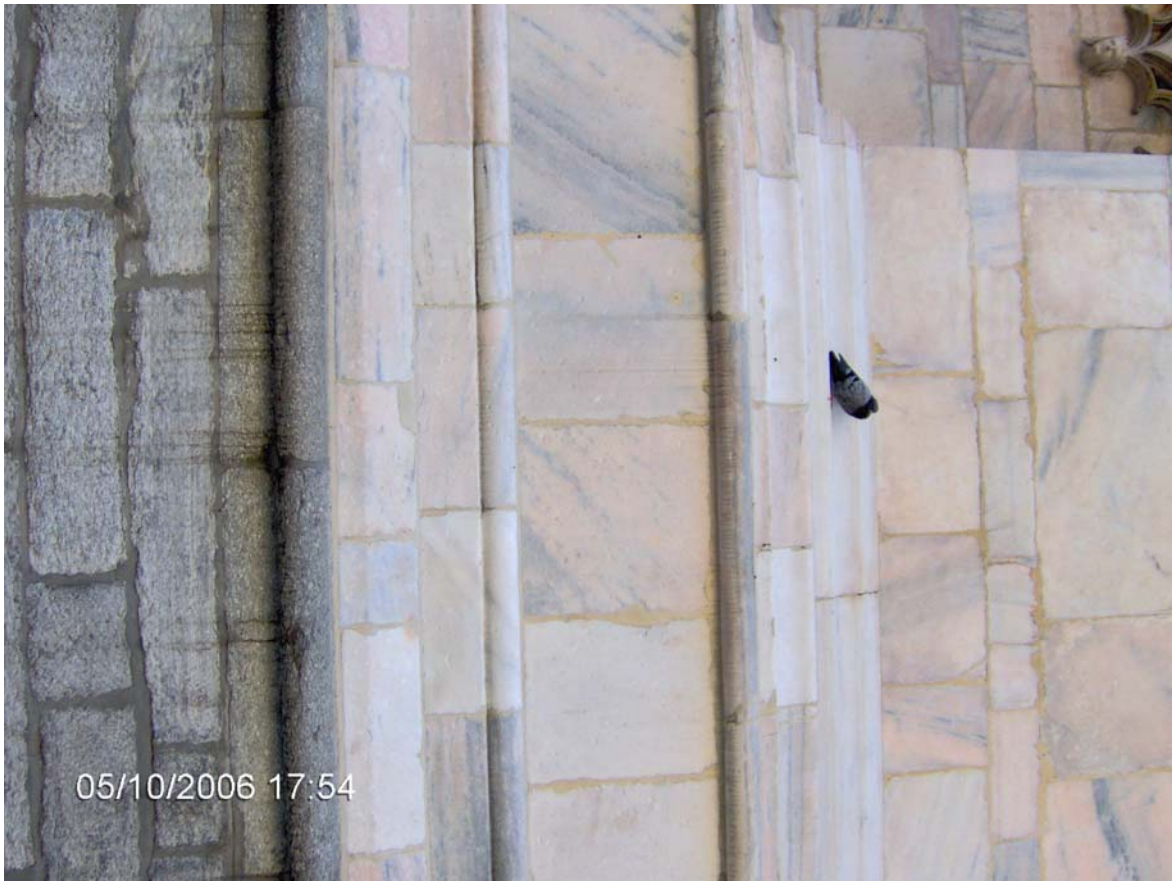
Το αρχαίο θέατρο της Δωδώνης χτίστηκε την περίοδο 297-272 π.Χ.

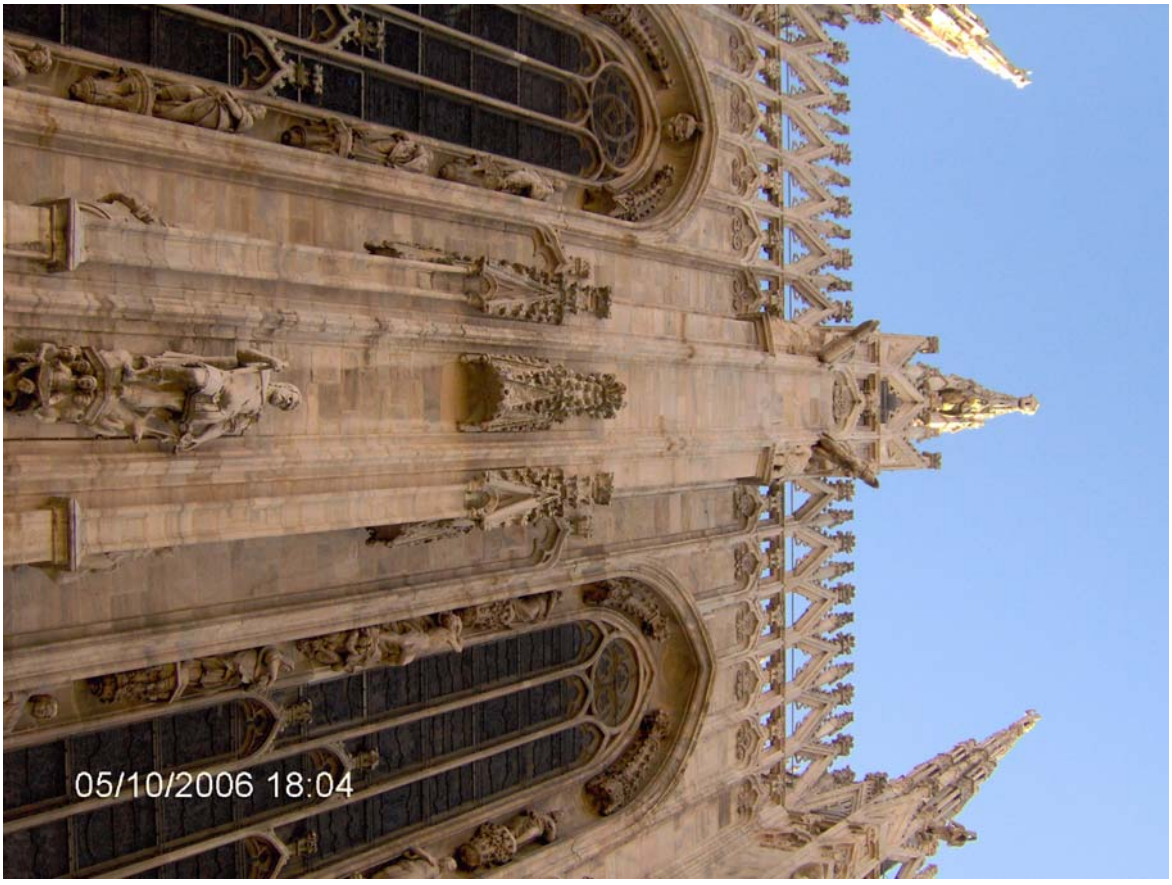
Αθήνα

«Οι φθορές στο θέατρο είναι τεράστιες» δήλωσε στην εφημερίδα ο προϊστάμενος της ΙΒ' Εφορείας Προϊστορικών και Κλασικών Αρχαιοτήτων Κωνσταντίνος Ζάχος. «**Δεν υπάρχει σχεδόν εδώλιο ή σκαλοπάτι που να μην έχει προσβληθεί από τη διάβρωση**», γεγονός που οφείλεται στην **κακή ποιότητα του αρχαίου λίθου, ο οποίος «λειώνει» από την υγρασία, με αποτέλεσμα να κόβεται στα δύο**.

news.in.gr

Il Duomo di Milano


05/10/2006 17:54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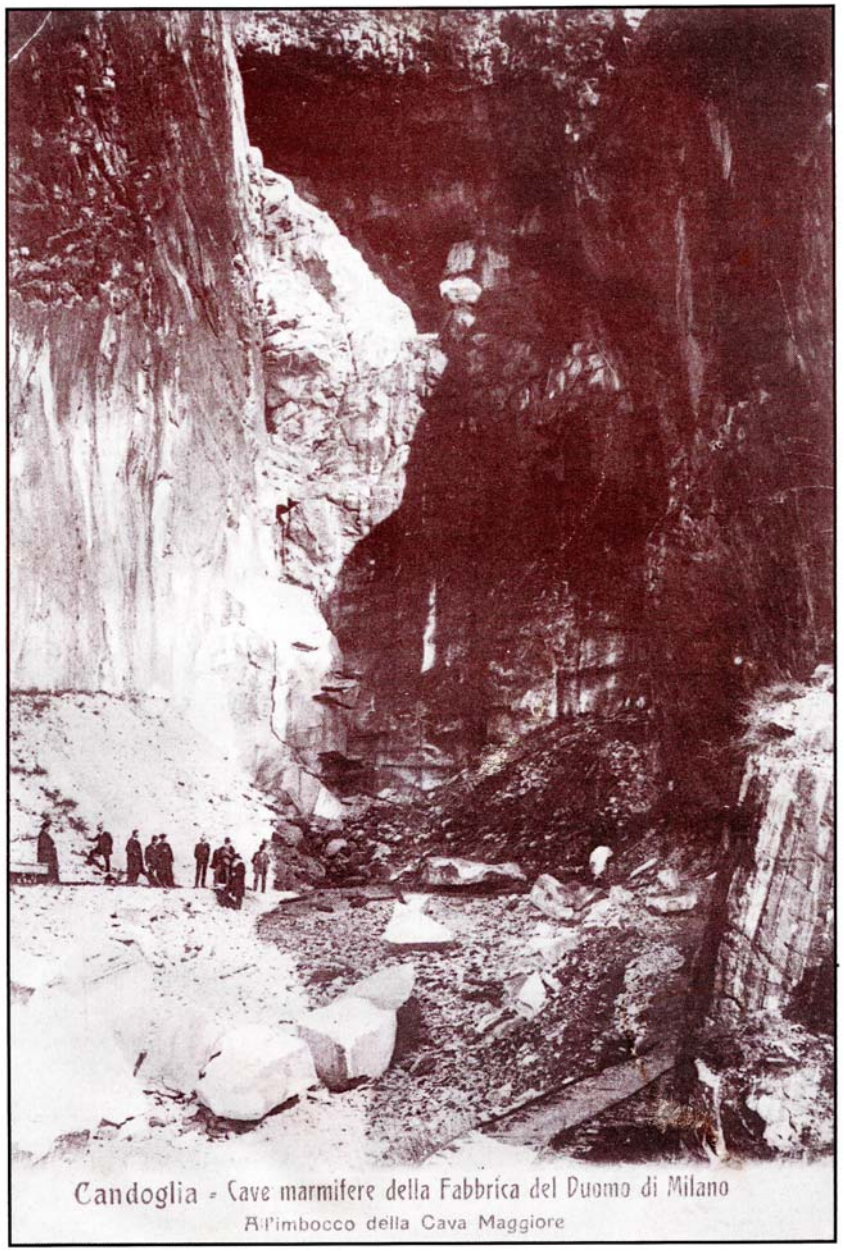
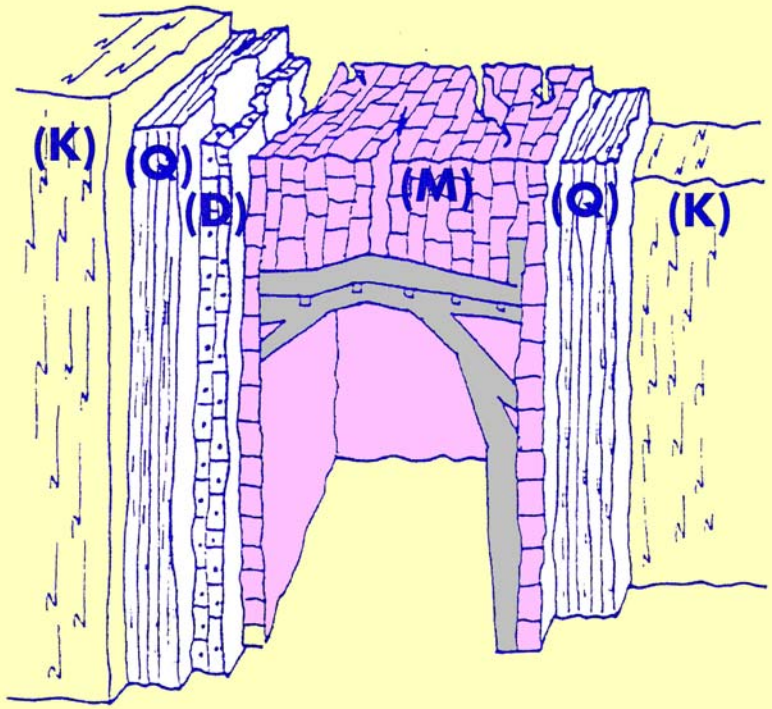


SCHEMA GEOLOGICO STRUTTURALE DELL'IMBOCCO DI CAVA MADRE



K = kinzigite

Q = quarzite

D = marmo dolomitico

M = marmo di Candoglia


CAVA
HAUKE


03/10/2006 15:47


A 7393
A 7392
A 7397
A 7398
A 7402
A 7324
A 7325
03/10/2006 15:49


DIVIETO DI OPERAZIONI
DI RIPARAZIONI SU ORGANI IN MOTO
ORME DI SICUREZZA
PER I MANOVRATORI PER L'ESERCIZIO DELLE GRU
03/10/2006 17:00


03/10/2006 17:00


03/10/2006 16:36


03/10/2006 16:43