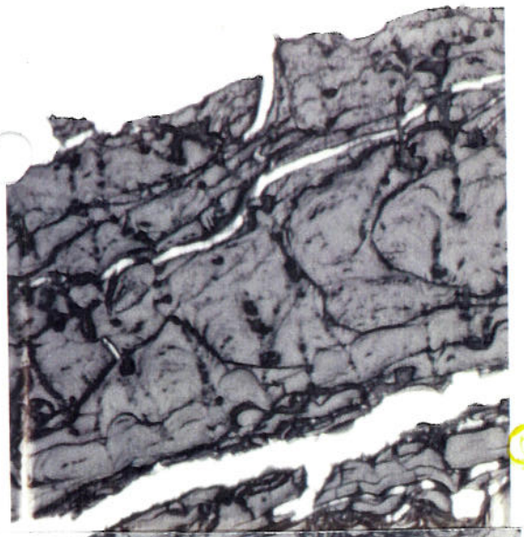
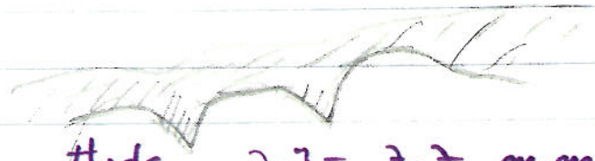
5x10x0.8. L5-82-SP. D8.





thick 7.3 – 7.7 mm

~~more 30μm thick Mn layer along with fractures~~

← discontinuity by development of parallel layers

compact zone

> 90 % botryoids with small clastics

← More 30μm thick Mn layer along with fractures

← ? unclear boundary

high porosity and organism-like form in valley.

←

massive (rich in Fe or Mn)

← distinctive discontinuity plane of growth, extend through the section

organism-like shape (forams) between botryoids (valley)

←

no botryoid growth regular discretion

~~high porosity even in botryoids~~

high porosity, filled with clastics, organism

irregular growth of botryoid

←

compact : dense of botryoids

regular form, beginning of growth

←

15 2. SP

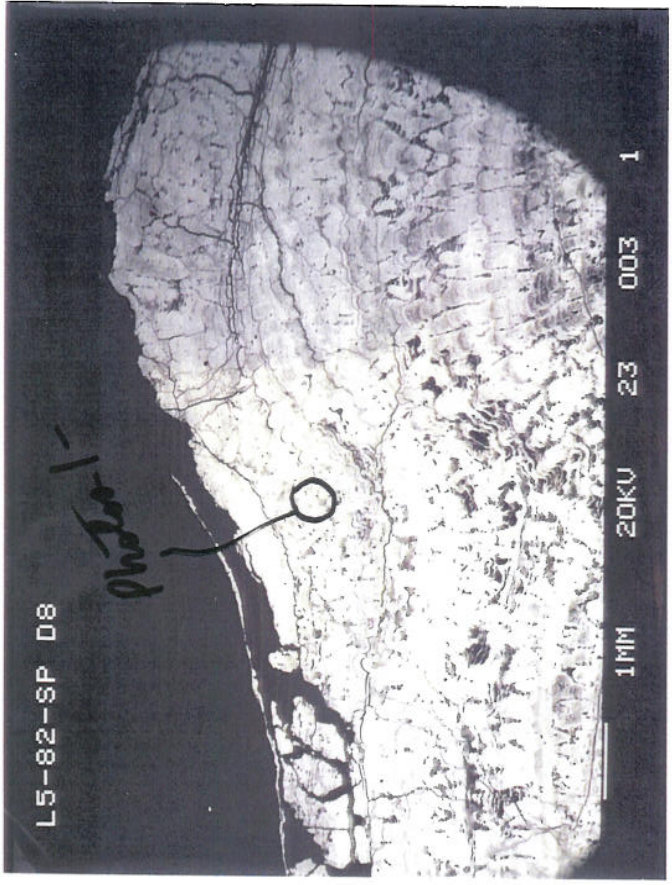


Photo 2

Photo 3

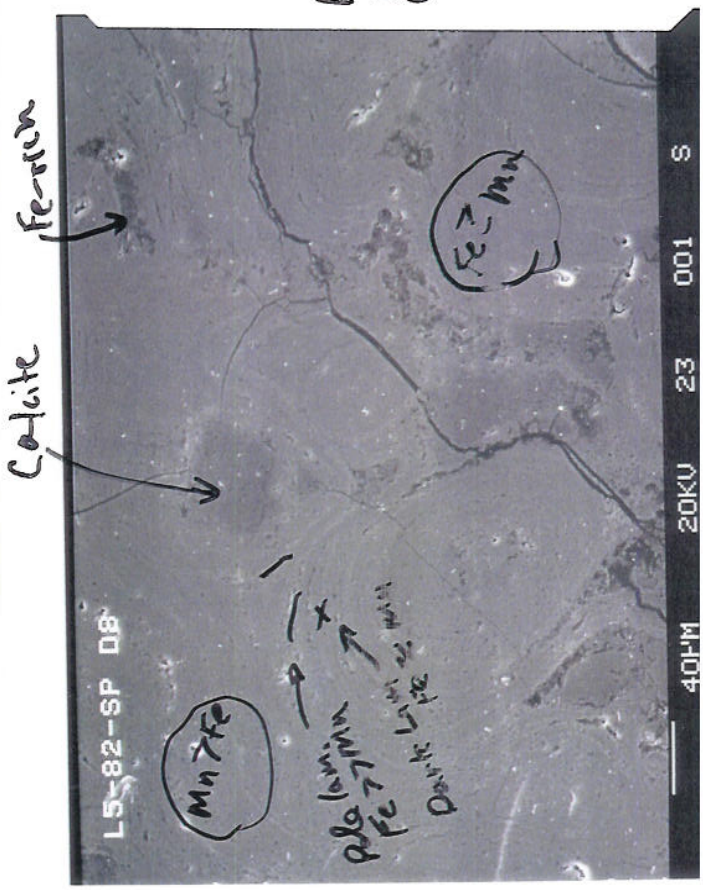


Photo 1, backscattered x-rays ~ Truncation of laminae

Photo 1; Med. Gray Calcite grains; Fe-rich oxide ~ pale gray

Photo 5

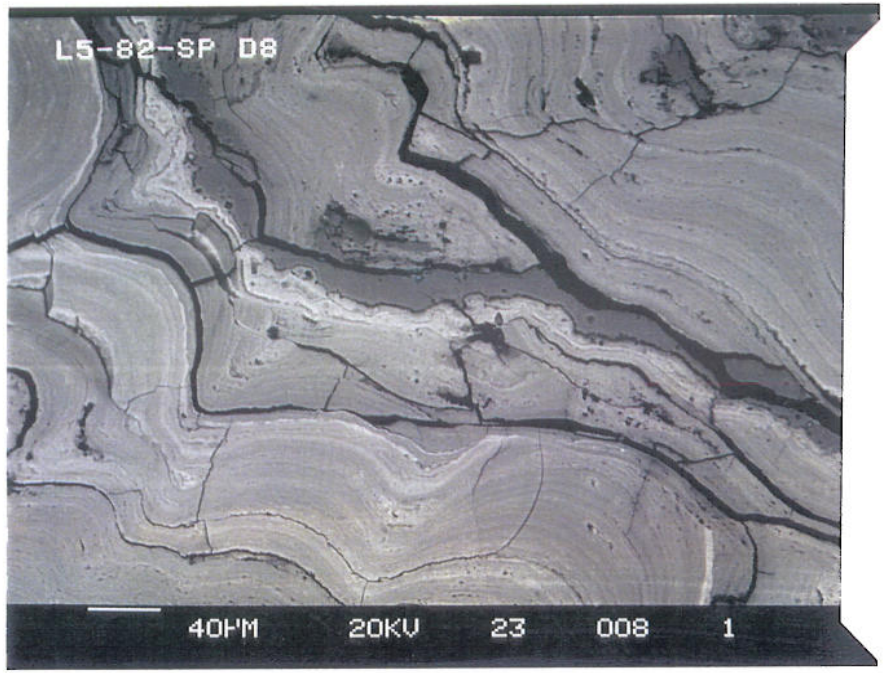
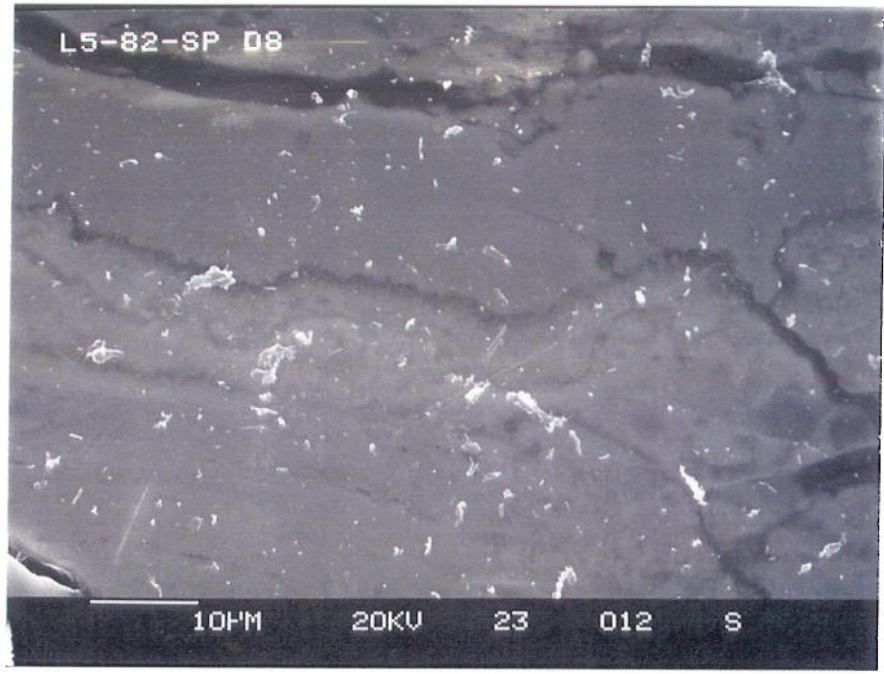


Photo 6A



see notes

Photo 4

Dark Gray chem. = Calcite

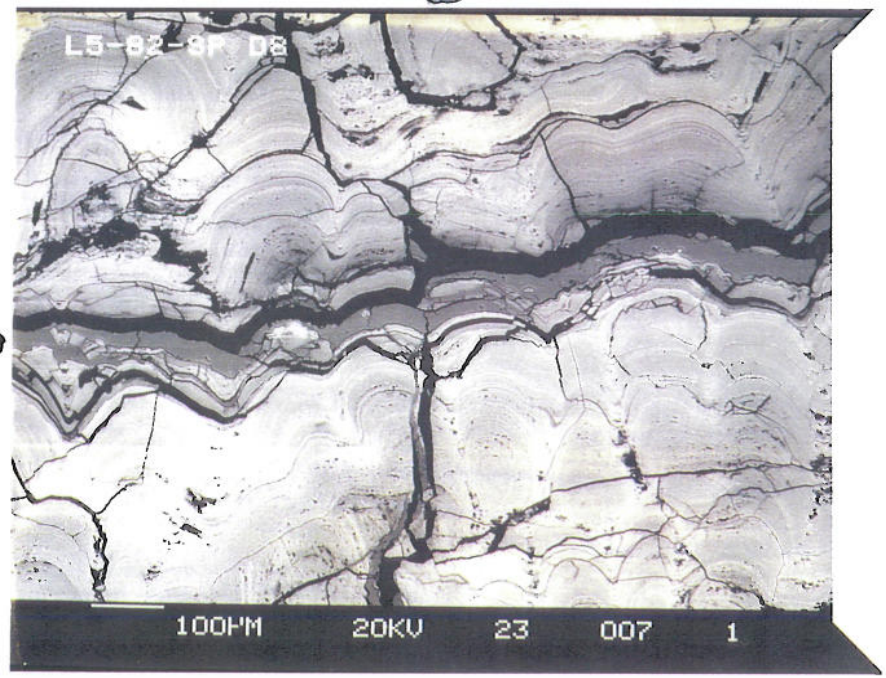


Photo 6

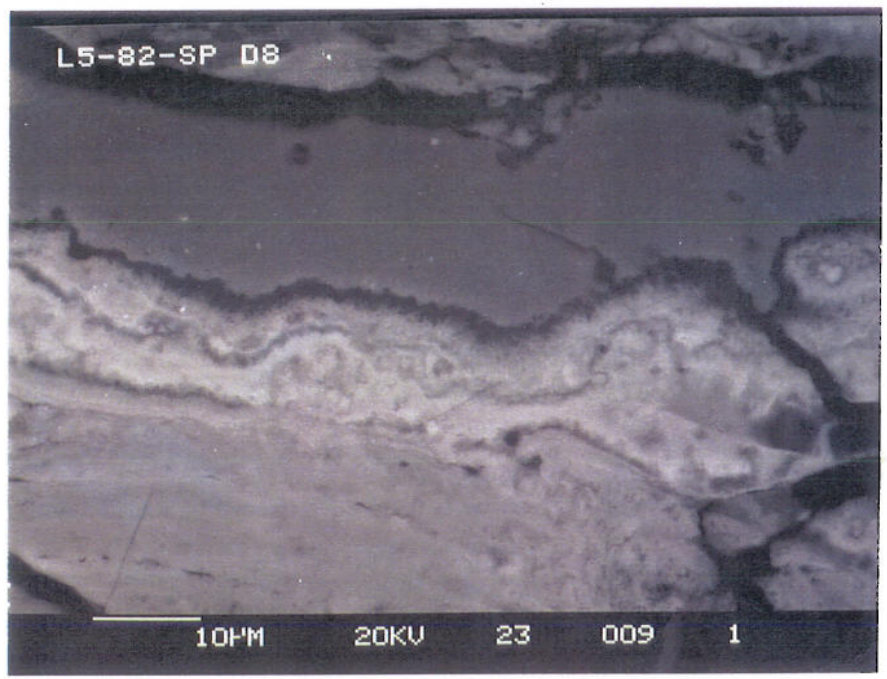


Photo 7

Calcite

xstals between Calcite Mn-rich layer

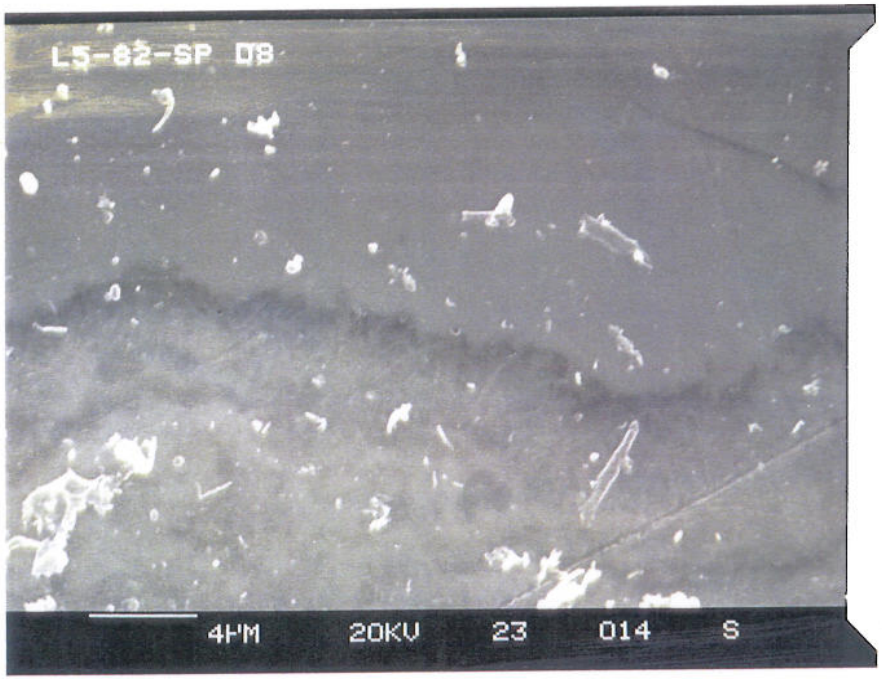


Photo 6

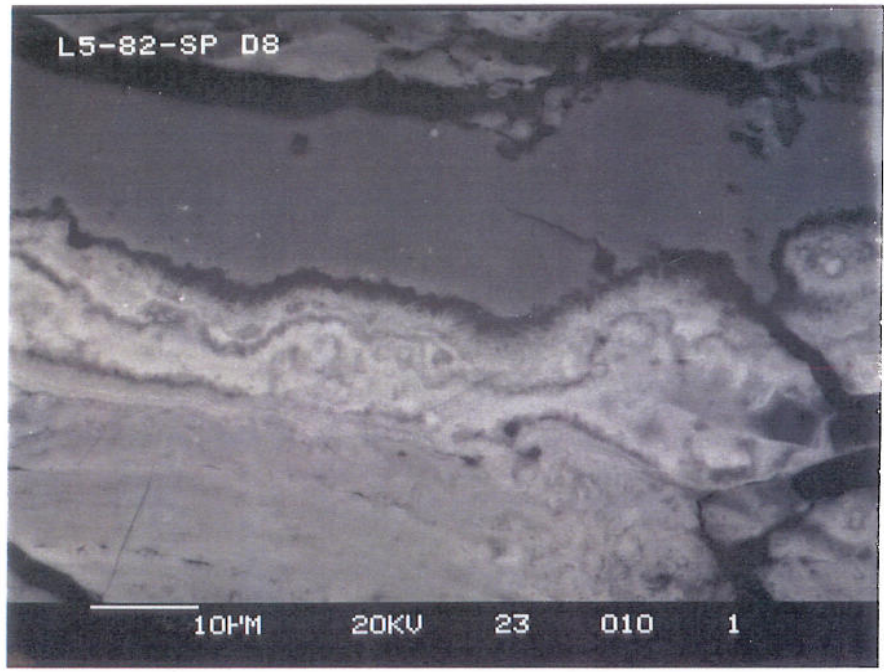


Photo 9

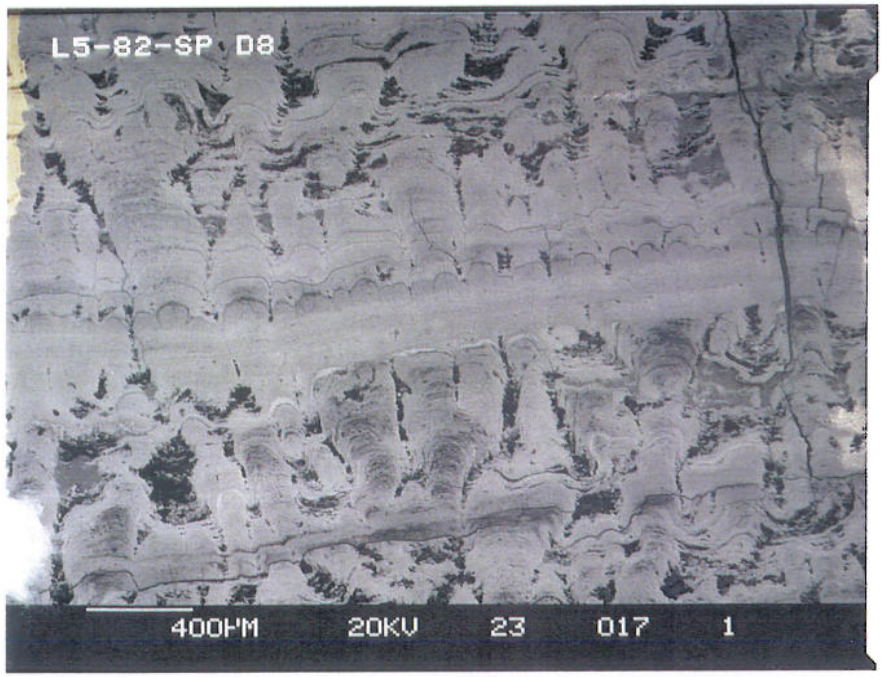
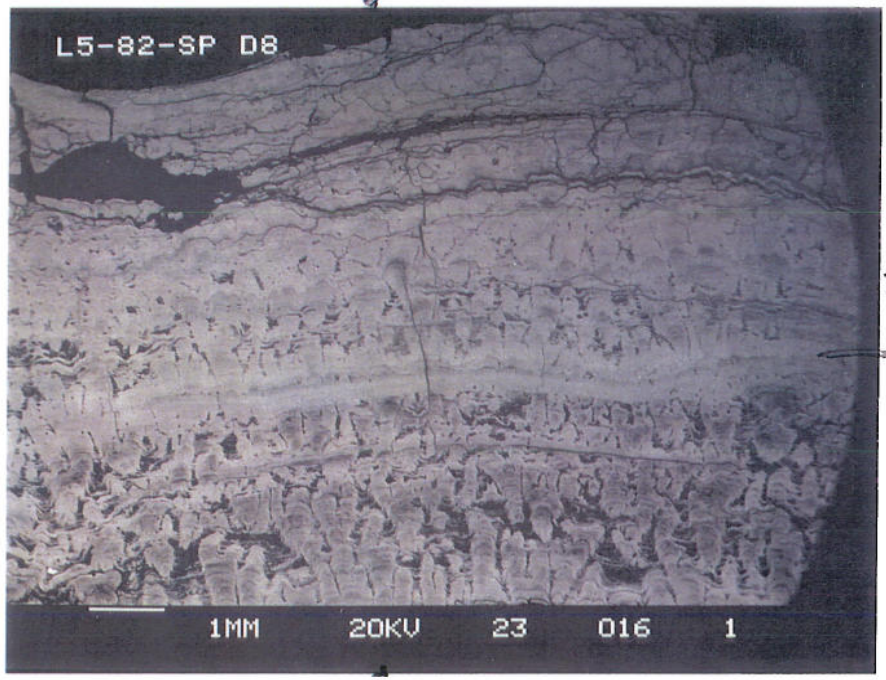
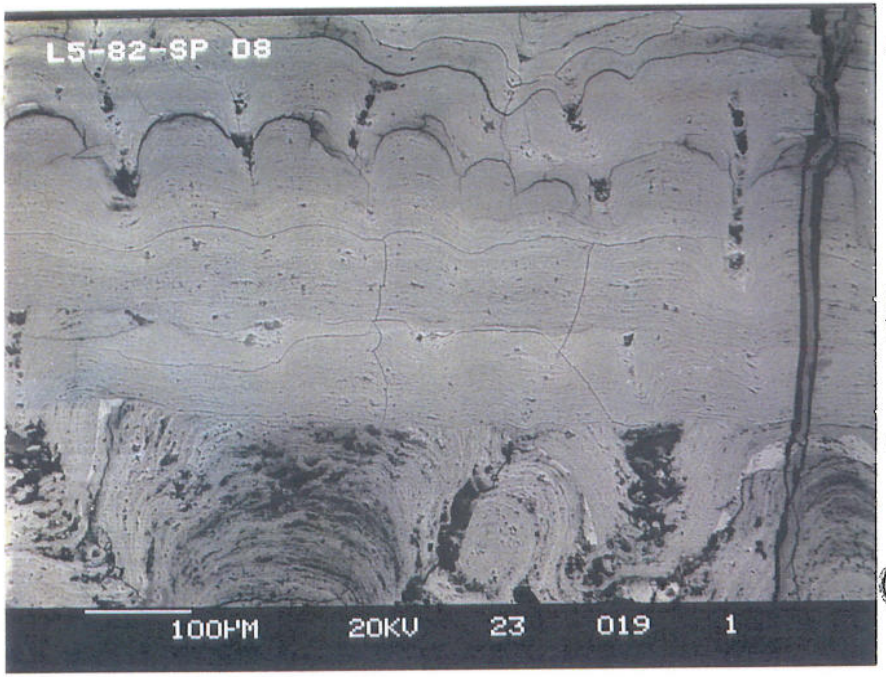


Photo 8

Trang's photo Transect



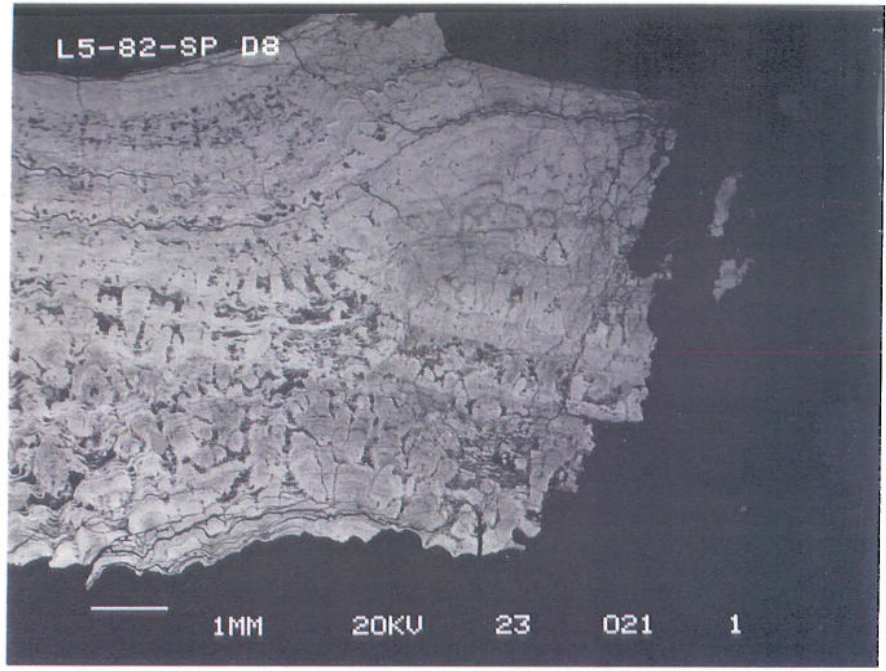


B

A

C

Plate 12



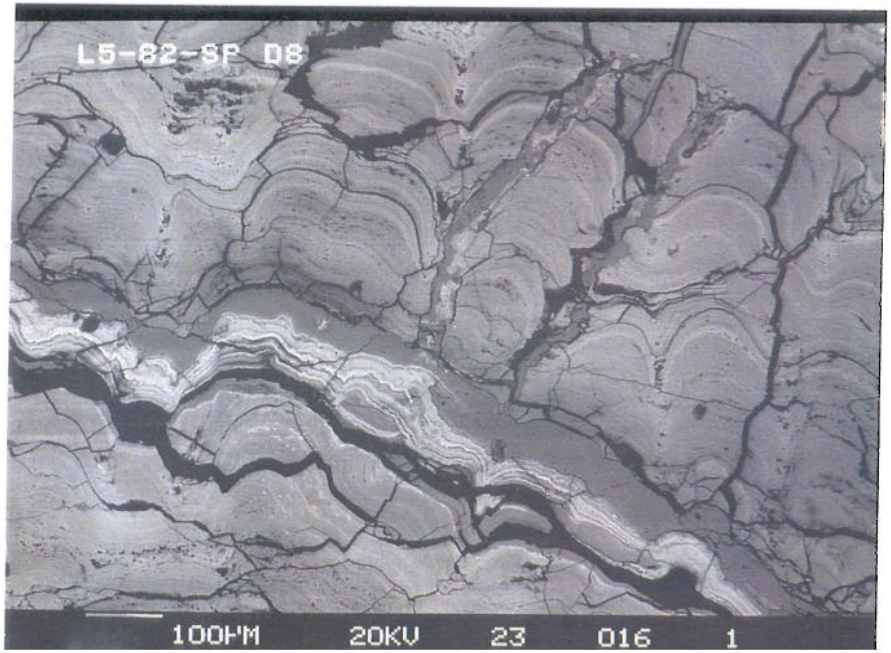


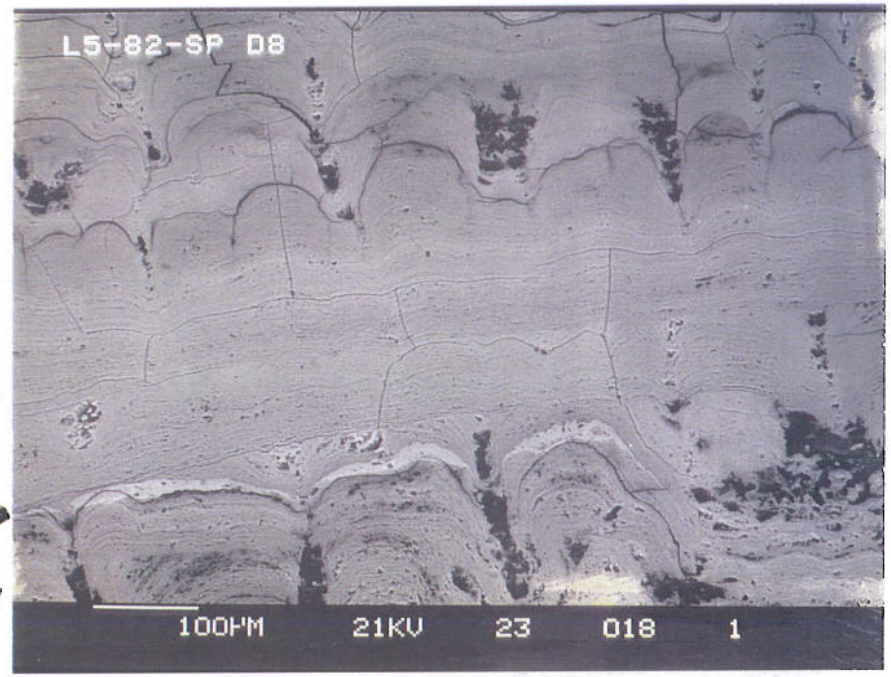
Plate 10

B

A

white D

C



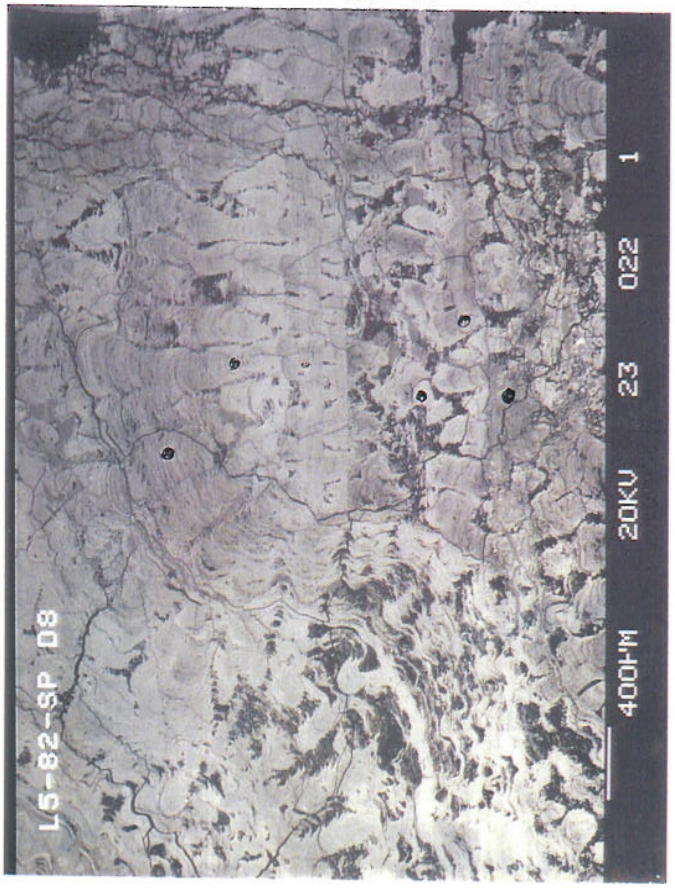


Photo 13.

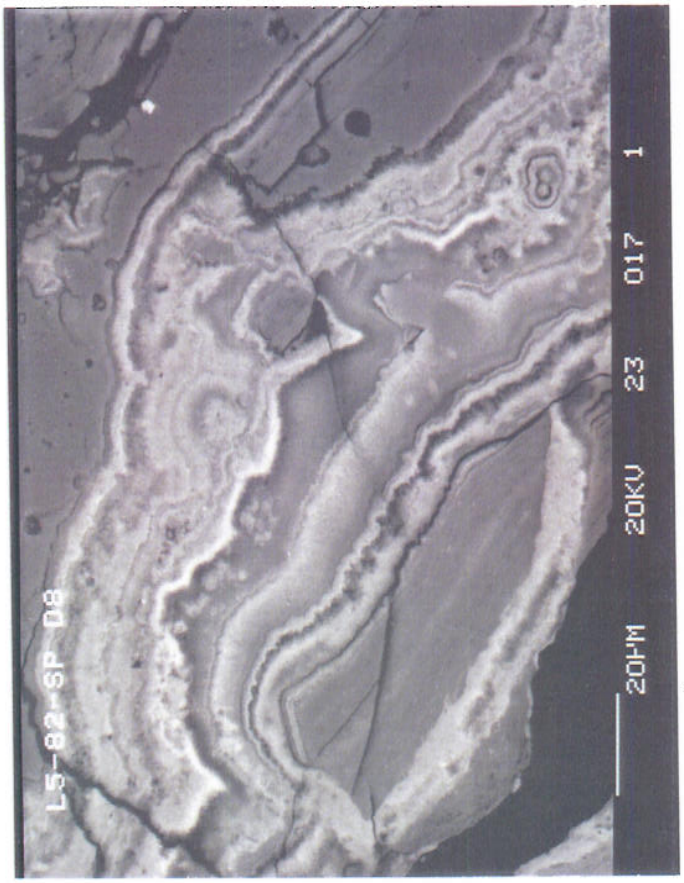


Photo 13

D8 – Low Basin L5-82-SP

Polished Section –

equant, calcite grains w/ laminae wrapping around them – some irregular

1.5 mm in from Top

Photo 1: Calcite grain, fractures, and laminae wrapped around grain

pale light laminae Fe ≫ Mn

dark laminae Fe ≈ Mn

Upper left of Photo – Corner general chem – Mn > Fe

lower right " " Corner Fe ≥ Mn

general photo shows many calcite grains

Photo 2 – upper part of crust to locate photo 1 – which is at its center

Photo 3 – Whole Crust Thickness at low surface botryoid

Thin Black Line (looks like stylolite =)

Photo 4 – Dark layer ≈ 1 To 1.5 mm from Top –

Darkest gray laminae in center = Calcite w/ some Fe + Mn in places

pale gray below = Mn ≈ Fe

Fe ≈ Mn → Fe = Mn grain at center Top

Fe-rich

One large below Calcite = Mn ≫ Fe

(dark gray)

Photo 5 following Calcite layer = Mn >> Fe laminae (v pale gray)
just below Calcite layer - layer just below Calcite -
Mn-rich = rhodochrosite ?? - Kutnahorite ??

Photo 6 - Calcite about needles of authigenic Mn (oxide ?) (CO_3^{--} ?)
in Mn-rich layer
6A - secondary X-rays

Photo 7 - Close-up of fibrous layer -
Fibers are Mn >> Fe w/ Little Ca, Ni,

Photo 8 - Whole Crust - different Section -

Photo 9 - Close-up of Central pale Mn-rich layer + layer below
at center of Photo 8 - Central layer Truncates lower layers
A pale Central layer - Mn > Fe
B upper layer - Mn ≃ Fe, more Ti
C lower layer - Mn ≃ Fe,
D Thin V. bright Layer - Mn << Fe ; Si,

Photo 10 - Close-up of Photo 9 -
Photo 11 - Close-up of Photo 9 -

Photo 12 - General - Rt side of sample - to look at truncation purposes -

Photo 13 = Close up of 12

Layer Chem

A = Mn ≥ Fe — wrap around layer

B = Mn < Fe — paler color

C = Mn = Fe — little darker

D = Mn ≤ Fe — disrupted botryoids

E = Mn < Fe

F = Mn > Fe

LJ-82-Sp. PA.

photo. 12 : Mn-layer in Fe-Mn lay.
/w $CaCO_3$ layer

chem : fissure → Mn / Ca

: Mn, Na.

paragen : Fe/Mn / Mn / Ca.

L5-82-SP D-8 (HG) SEM 9-13-88.

photo 1. 2ndary X-rays / backscattered X-rays
1cm from upper surface
botryoidal growth of Fe-Mn oxides / truncation of laminae
variations chemical composition: light laminae Fe >> Mn
dark laminae Fe ≃ Mn
calcite filling in depressions or nucleans for botryoids
Fe rich substances, probably nontronite ??, filling in depression
areal general chemical composition;
: upper left of photo - corner : Mn > Fe
: lower right of photo - corner : Fe ≥ Mn

photo 2, 3 backscattered X-rays
whole crust from upper surface to lower (one part of samp
1/3 upper, dense population of botryoids
show stylolite-like texture
parallel fractures to surface plane.
not distinctive boundary line to lower part
2/3 lower, long botryoids small density to upper
deep depressions filled with ?

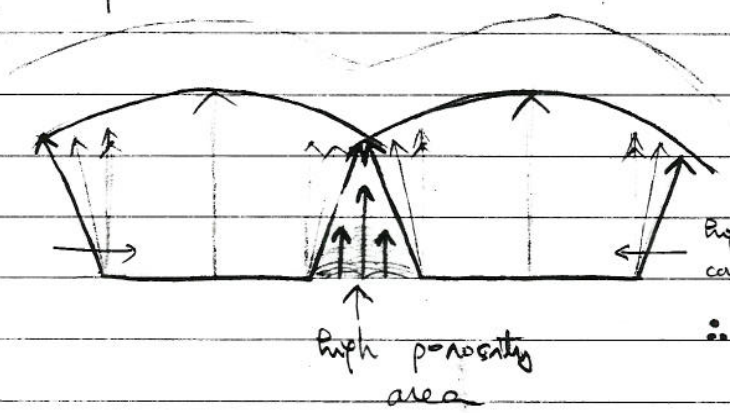


Photo 4 : back scattered x-rays
calcite layer associated with fracture zone
cryptocrystalline calcite
vein ?? becaus of including Fe-Mn layers in calcite bed.
fracture developped later than calcite deposits.

Photo 5 : back scattered x-rays
Mn layer / calcite layer along with fracture

deposit	paragenesis (time)
Fe-Mn	⟶
Mn	⟶
calcite	⟶
fracture	⟶ ⟶

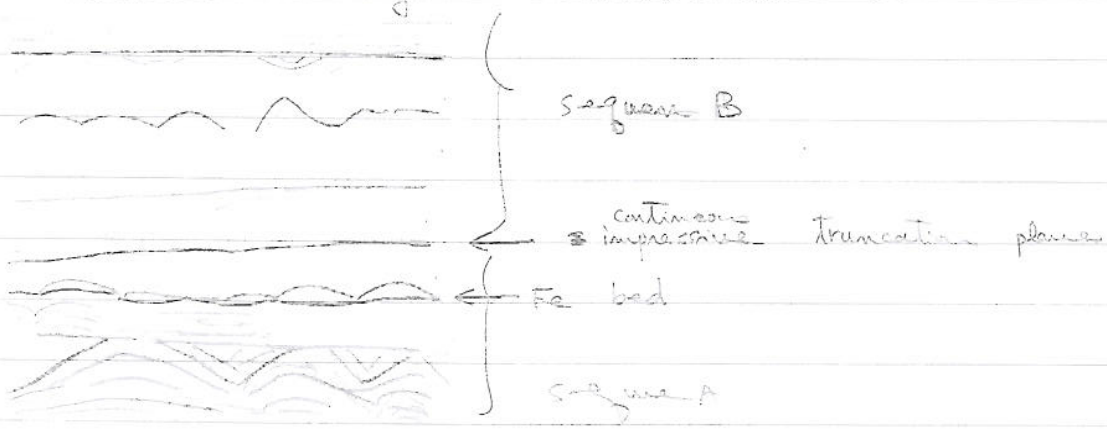
what kind of Mn deposits, hydrothermal or diagenetic
Mn mineralogy, rhodochrosite ??, Kutnahorite ??
fibrous needle crystals at contact with calcite
→ Authigenic Mn oxides

photo 6, 7 : backscattered x-rays / 2ndary x-rays
Mn layer high magnification
Mn deposits occur above Fe-Mn layer
1st → cryptocrystalline band ← mineralogy ??
2nd → fibrous needles band ← mineralogy ??
Fibers are Mn ≫ Fe with little Ca, Ni

photo 8 : whole crust — central part of sample.
Back scattered x-rays.
parallel fractures to surface plane at upper section.
textural changes occur as parallel to surface plane
; fractures, truncation (discontinuity / disconformity etc).
2 ~ 2.5 cm from upper surface, thick Mn deposite layer occur
which show relatively strong reflectivity and pale light grey
in color, Mn deposite layer pinch-out to left.
massive, dense, lower porosity at 1/2 upper section,
long botryoidal growth, high porosity at 1/2 lower section
without distinctive boundary between both above.
particularly, at lower section, a strongly impressive change
in deposite occur with parallel, continuous and nearly
flat truncation. After this change, same depositional
condition continued some time and later changed sequence
to dense, lower porosity botryoidal growth of Fe-Mn nodes.
deposit change by Truncation show differences in chemistry ;
Mn > Fe layer occured after truncation.

Photo 9. 10. 11 Back scattered X-ray
High magnification of, photo 8, truncation area
massive laminae (upper) < Mn ≃ Fe
Mn > Fe
→ truncation — . — . — . —
porous laminae (lower < Mn ≪ Fe * Fe-rich deposite
Mn ≃ Fe
even small area in term of thickness,
5 time truncation (?) changes are shown in photo 10

photo 10, 11 : Backscattered X-rays

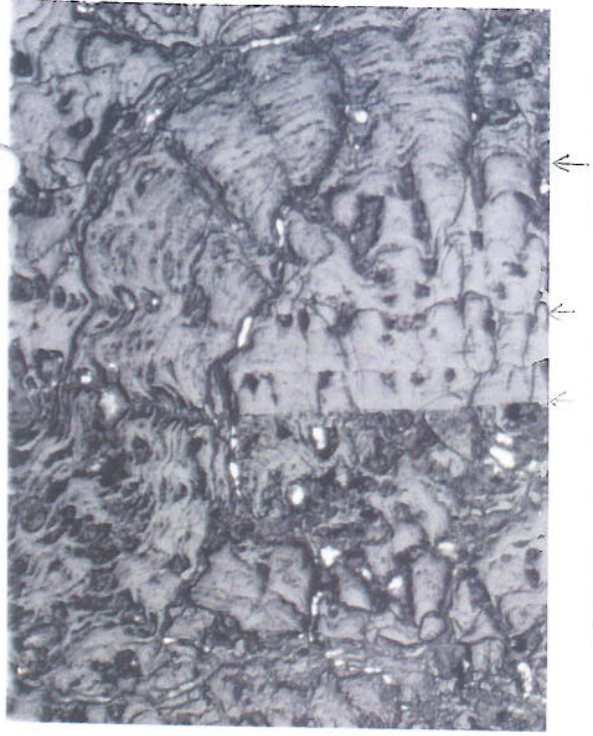


sequence B show Mn > Fe
Fe-rich bed
high density of truncation

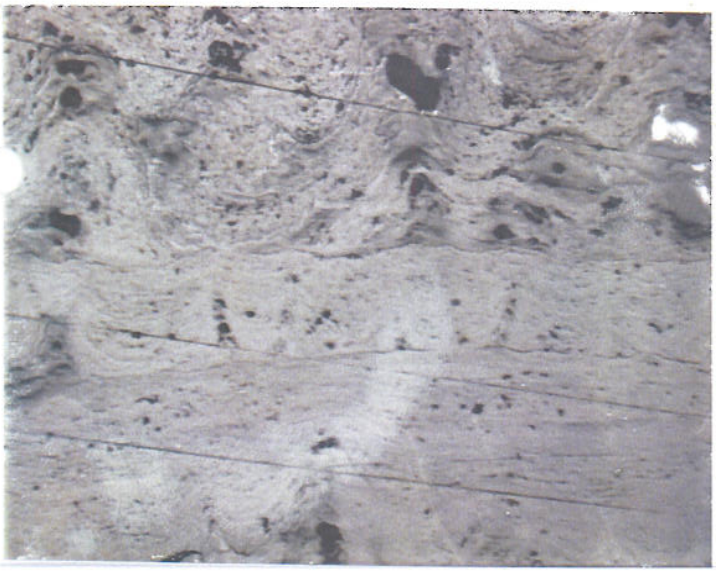
imply unstable seawater / earth stability / because of hydrotermalism work a strong mixing.

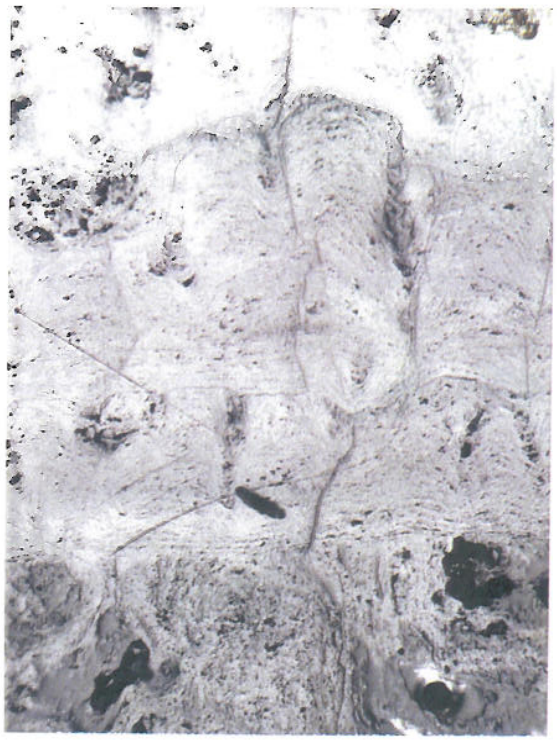
photo 12, 13 : Backscattered X-rays / right section of sample.
sequential drapes in right side by parallel as photo 9, 10.
in center by coverage as new deposite
from lower to upper (older to new deposite)

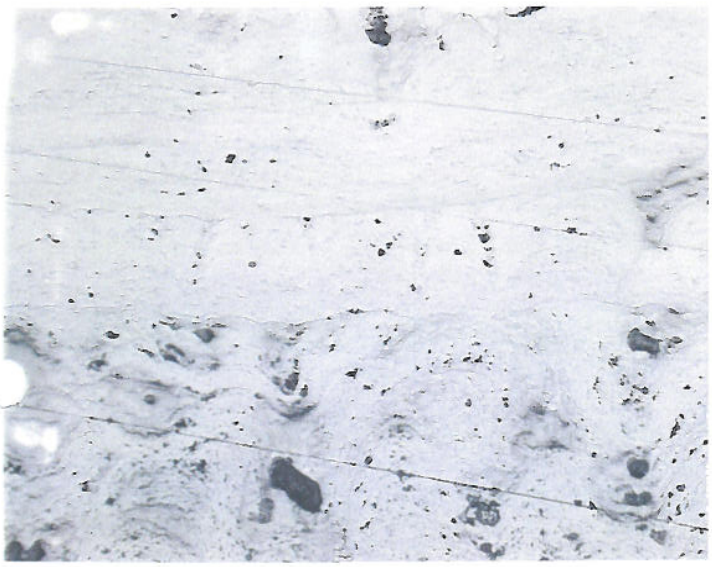
A : Mn ≥ Fe
B : Mn < Fe
C : Mn = Fe same as photo 11, point B
D : Mn ≤ Fe same as photo 11 point C
E : Mn < Fe
F : Mn > Fe



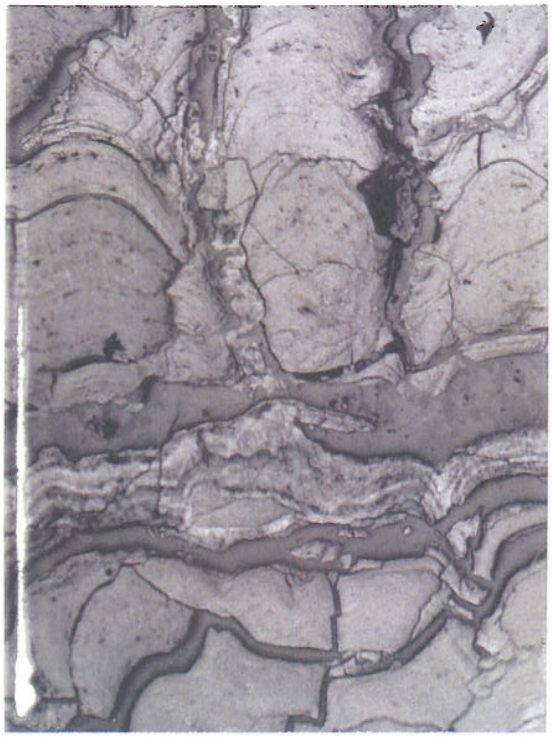
L5-82-SP
D8

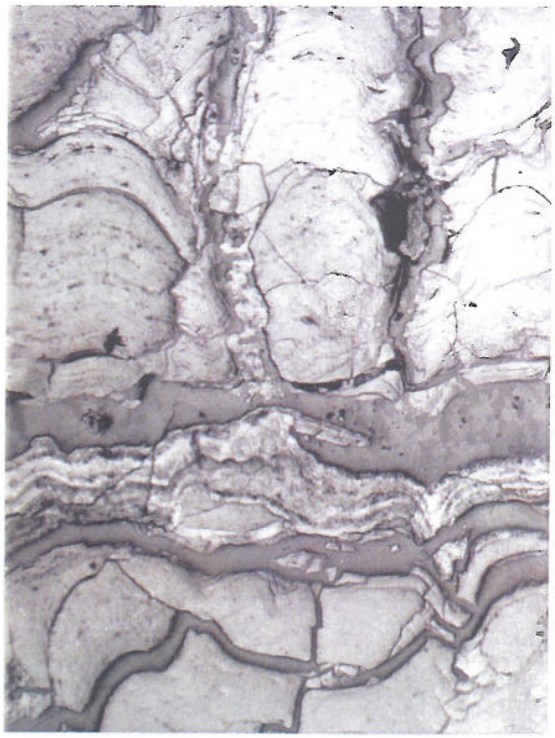




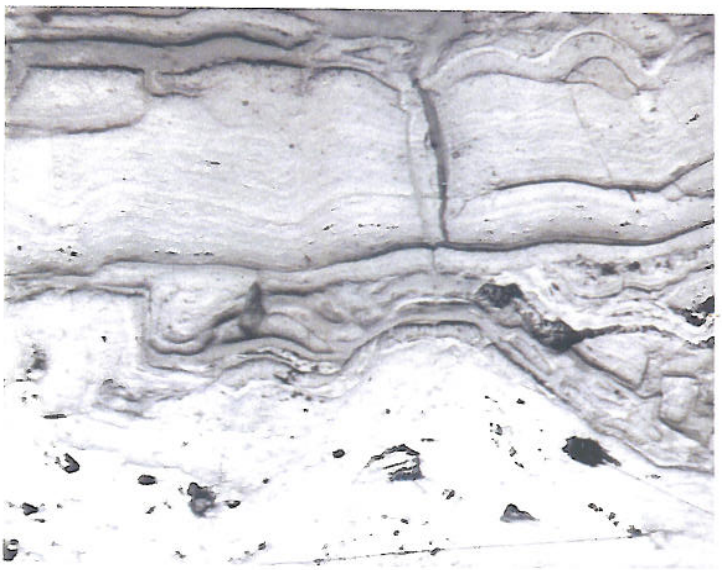


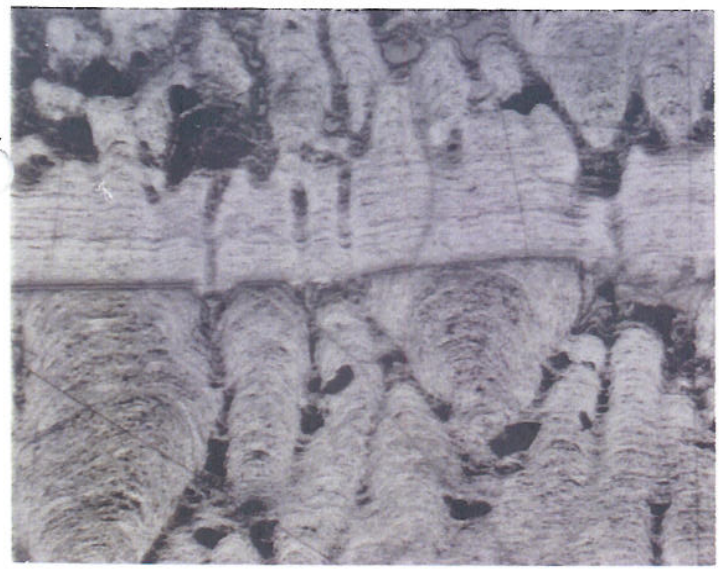
LS-82-5P D8



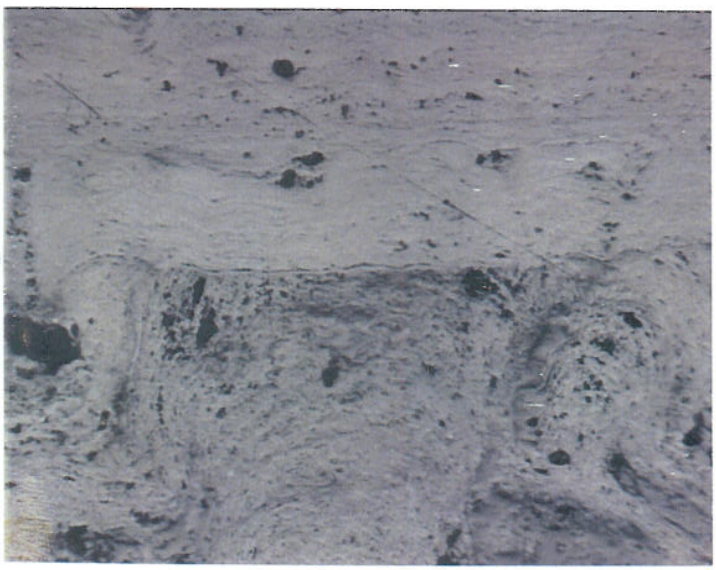


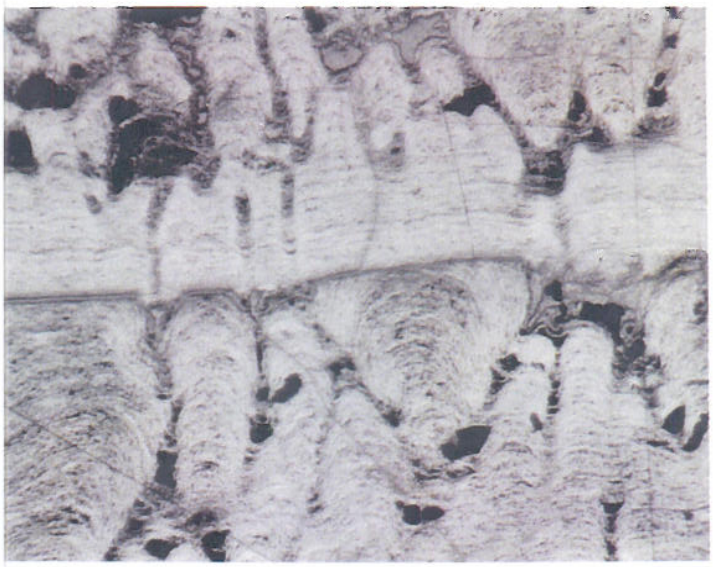
20X10

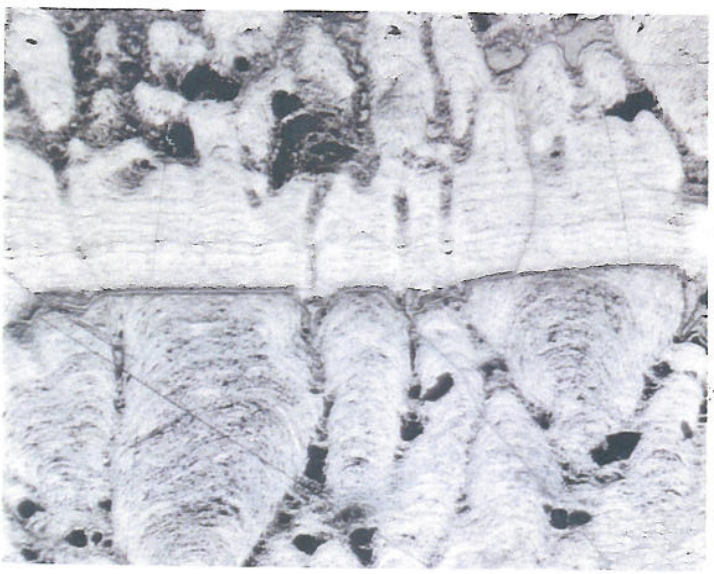


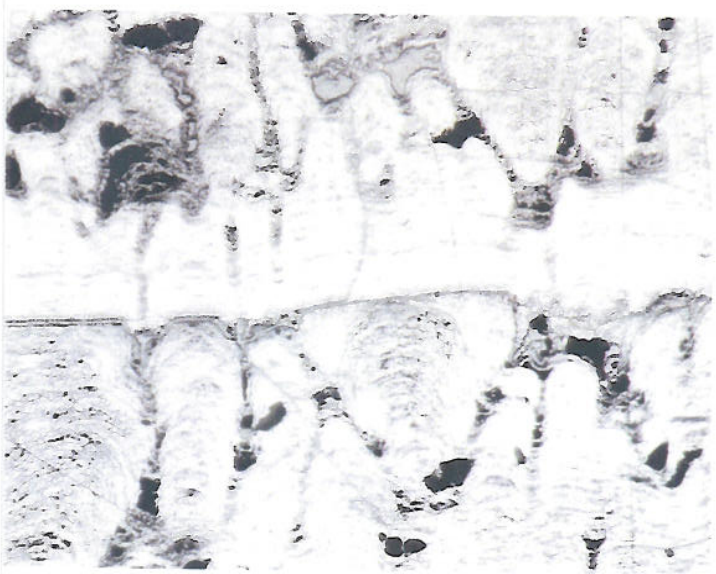


L5-82-5P D8

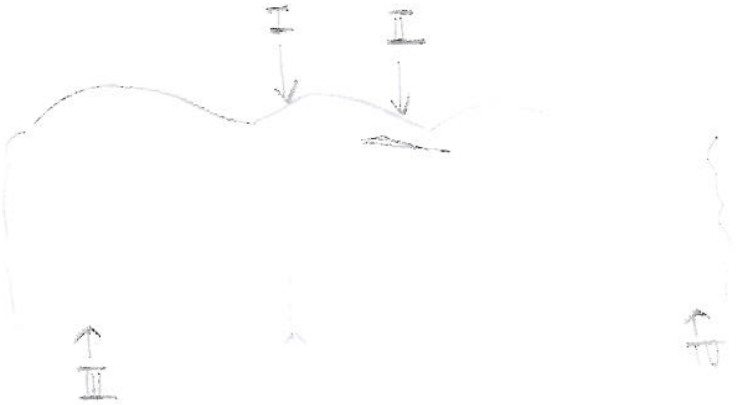








SEM. [illegible] 88
(L5-82-sp.D8)



I : From top to bottom
→ variation sequence classified 5 kind textures
→ change in composition (Fe-rich zone)
→ if correct, elemental distribution (Mn. Fe. Si)

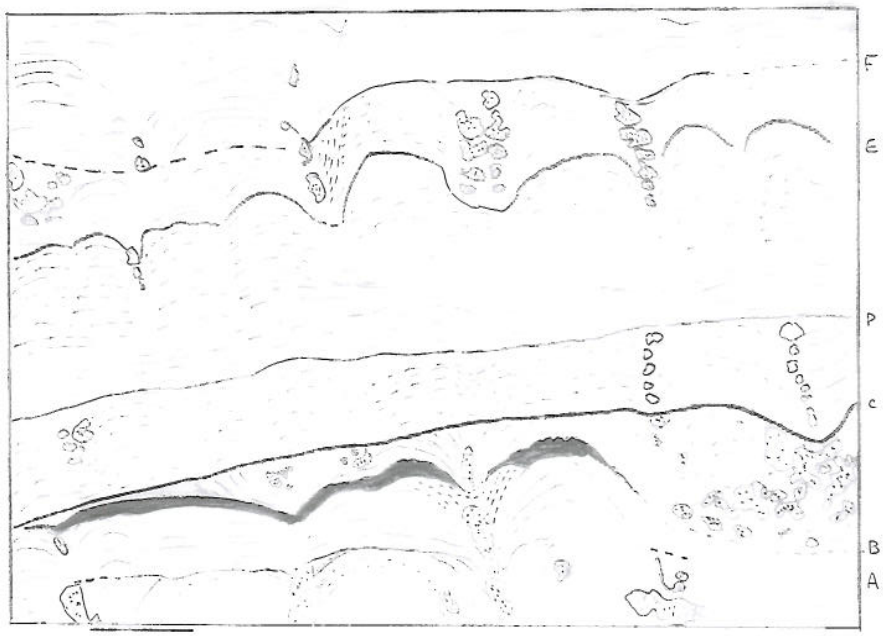
II : Mn layer intercalated in Fe-Mn layers
→ photo
→ elemental distribution (Mn. Fe)

III : texture changes
→ photo various area
→ elemental distribution (Mn. Fe.)

IV : textural changes in small area (several times)
→ photo

100 µm

photo 10. LS-82-SP. D8



100 µm