

CNWRA

PETROGRAPHIC ANALYSES

of

VOLCANIC ROCKS

PENA BLANCA, CHIHUAHUA, MEXICO

PAEI-ECP-1

PETROGRAPHY

Sample No.: PUE1 - ECP-1-T31

Locality: Sierra Para Blanca, Chihuahua, Mexico

Formation: Corrales

Classification (rock type): crystalline dacite tuff

Matrix or groundmass: 85-90%

Cryptocrystalline quartz-feldspar intergrowth (~40%), <0.03 mm
Spherulitic K-feldspar (orthoclase?) ~45%, 0.1-0.5 mm
Quartz replacing glass shards (<1%), 0.1 mm

Grains or crystals: 10-15%

Phenocrysts:

Quartz - 0.05 to 2.5 mm (1-3%)
Feldspars - 0.05 to 2.5 mm (10-12%)
Biotite - 0.05 to 2.5 mm (1-2%)

Lithoclasts:

Quartz-feldspar (~1%)
Opagues (iron/titanium oxides) (~1%)

Texture or fabric:

Densely welded with some vitroclastic texture preserved. In plane light, ghostlike vestiges of glass shards remain and run through spherulites indicating the spherulites formed after deposition.

Texture of groundmass results from devitrification of glass-replacement by cryptocrystalline quartz-feldspar intergrowths and spherulitic K-feldspar.

In plane light, primary vitroclastic texture preserved even though rock is now crystalline. Glass shards are flattened and parallel

Alteration/Mineralization: to depositional plane suggest compaction. (cont. on back).

Quartz replacing glass shards where they are preserved.

Groundmass of Qtz-feld. intergrowths and Feldspar spherulites results from devitrification of glass.

Feldspar phenocrysts show alteration to clays (sericite). Alteration occurs at edges + along fractures.

Volcanic processes or depositional origin:

Pyroclastic air fall or flow.

Texture or fabric:

12/14/2011

Feldspar spherulites have a central nucleus which is commonly a phenocryst in the original glass. The phenocryst acts as a seed to initiate crystallization.

PETROGRAPHY

Sample No.: PUEI-ECP-1-TS2

Locality: Sierra Pena Blanca, Chihuahua, Mexico

Formation: Corrales

Classification (rock type): crystalline dacite tuff

Matrix or groundmass: 85%

Cryptocrystalline quartz-feldspar (~40%), < 0.3 mm
Spherulitic feldspar (~45%) 0.1-0.5 mm
Qtz infilling glass shards - (<1%) 0.1 mm

Grains or crystals: 15%

Phenocrysts:

Quartz (1-3%) 0.05 to 2.5 mm
Feldspars (10-12%) 0.05 to 2.5 mm
Biotite (1-2%) 0.05 to 2.5 mm

Lithoclasts:

Quartz-feldspar (<1%)
Opagues (~1%)

Texture or fabric:

Same as PUEI-ECP-1-~~TS2~~ TS1

Alteration/Mineralization:

Same as PUEI-ECP-1-TS1

Volcanic processes or depositional origin:

Pyroclastic air fall or flow

PHOTOGRAPHY

Photographer: JP

Microscope: Nikon

Type of photography: Standard thin section

Camera: Nikon

Date: 5/1/91

Film: Kodacolor Gold 100

Photo No.	Sample No. and description	Obj.	FOV	Light
	<u>PUE1-ECP-1-TS1</u>			
9	Ground mass of crypto crystalline gtz-feld, feldspar spherulites, and glass shards replaced by quartz. Entaxitic texture	4x	3mm	XN
10	Same as #9	4x	3mm	PL
11	Plagioclase phenocryst in groundmass of crypto crystalline gtz-feldspar, and spherulitic feldspar	4x	3mm	XN
12	Same as #11. Notice entaxitic texture.	4x	3mm	PL
13	Feldspar alteration - clay forming at core and along fractures.	4x	3mm	XN
14	Feldspar alteration, biotite phenocryst.	4x	3mm	XN
15	Groundmass - closeup of gtz-feldspar intergrowths + spherulites. Notice spherulite nucleating on phenocrysts	10x	1.7mm	XN
16	Same as #15.	10x	1.7mm	PL

PHOTOGRAPHY

Photographer: JP

Microscope: Nikon

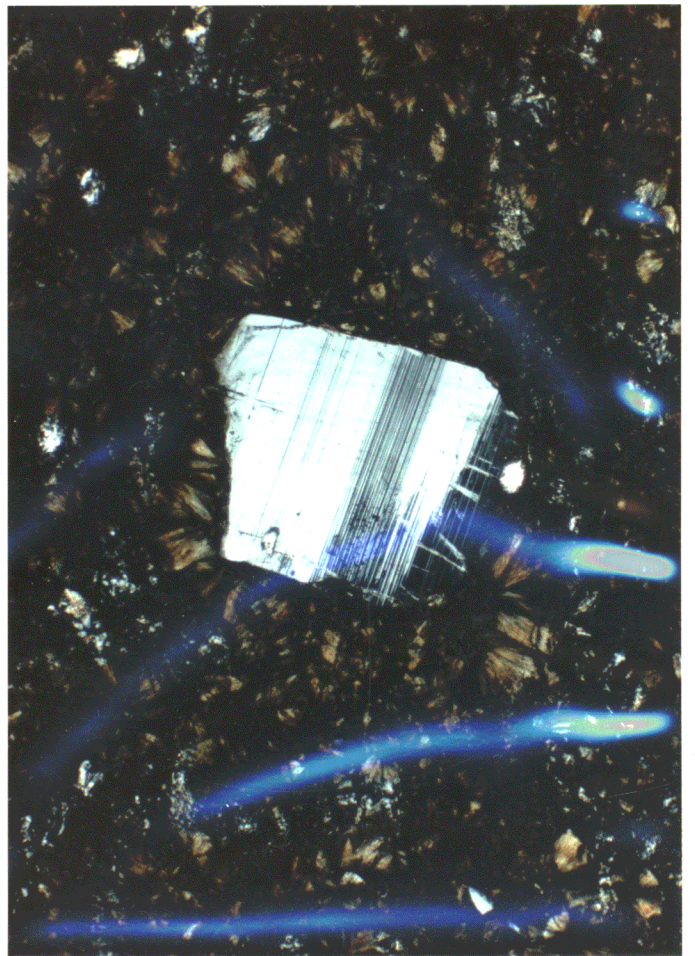
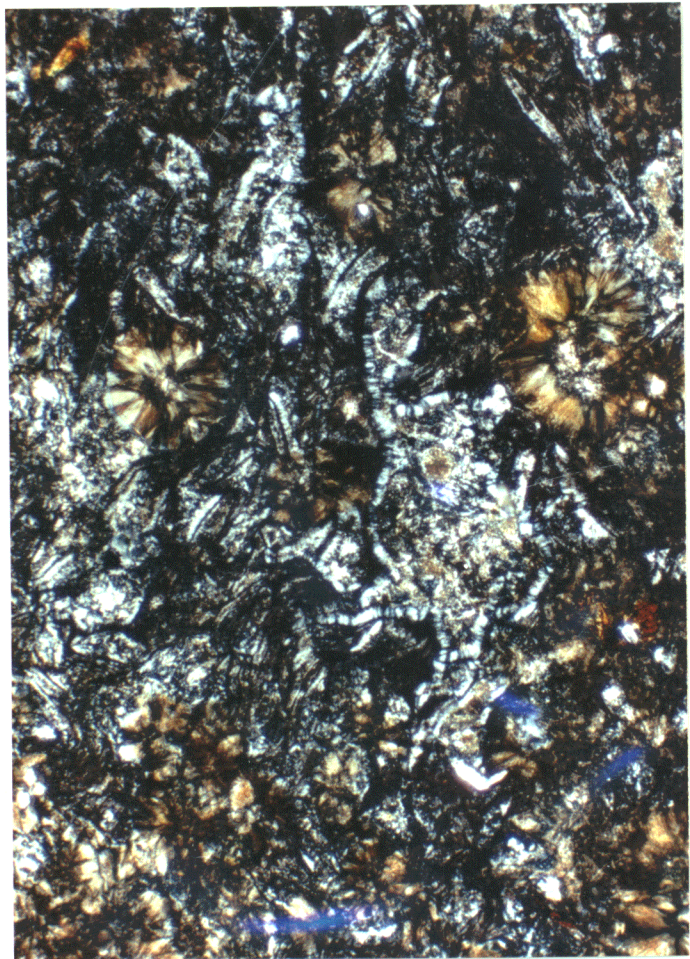
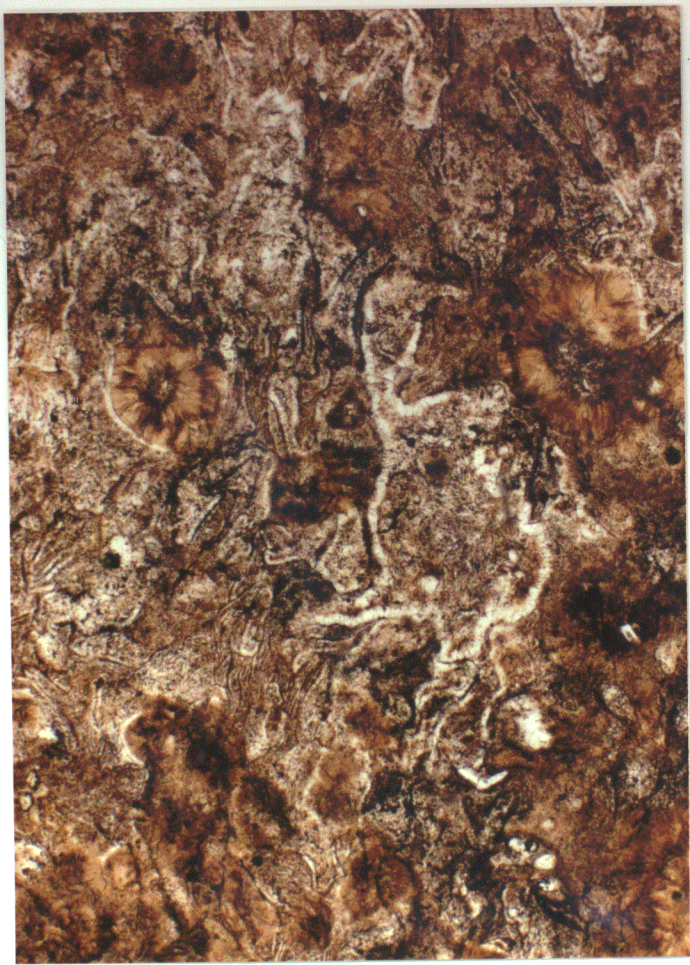
Type of photography: Standard thin section

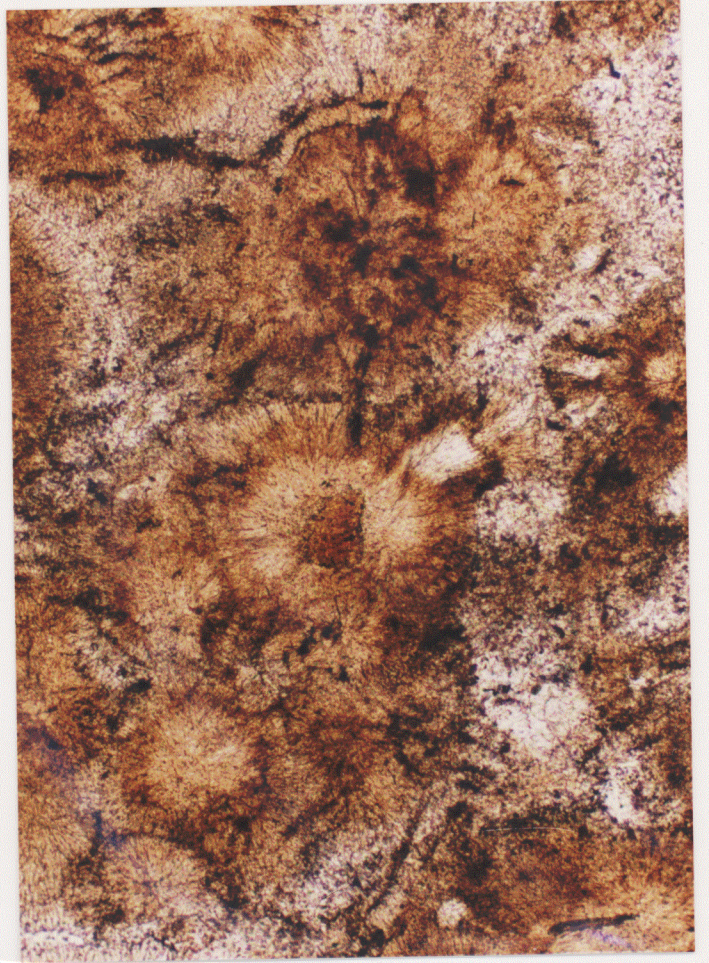
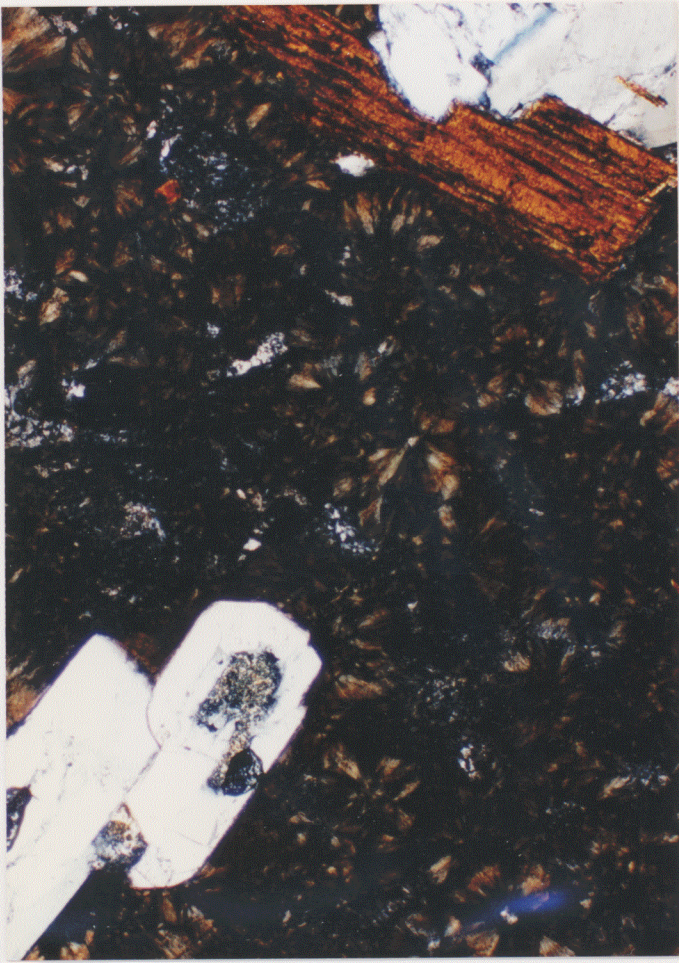
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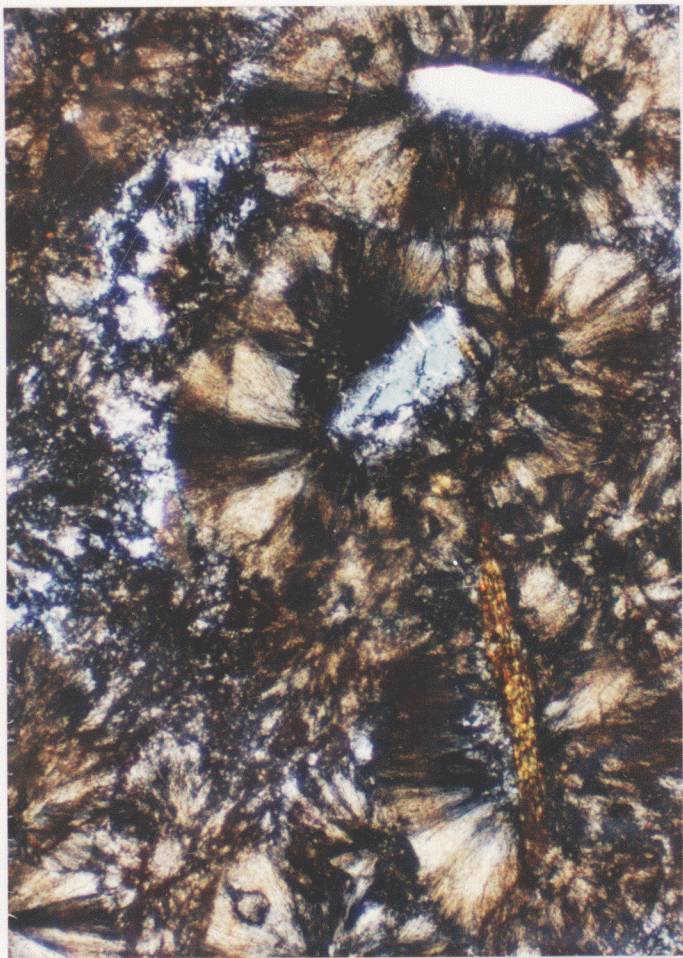
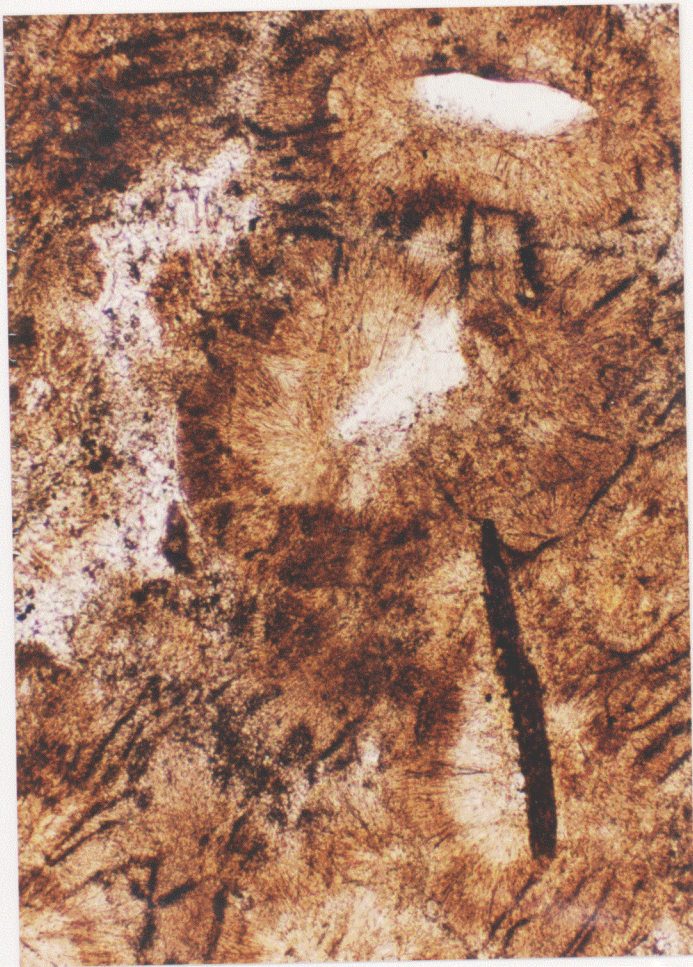
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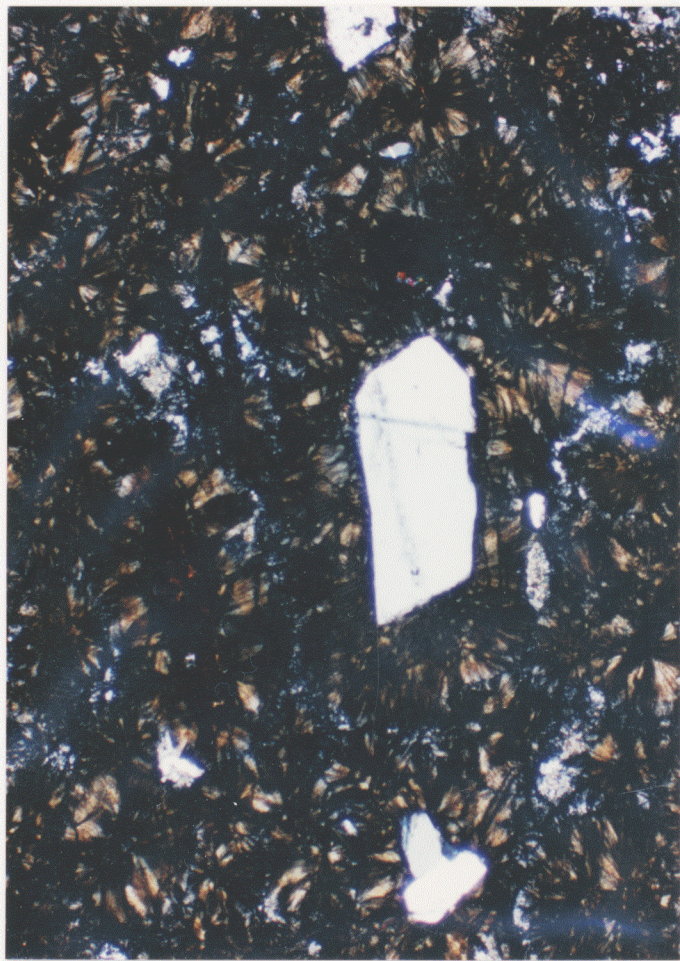
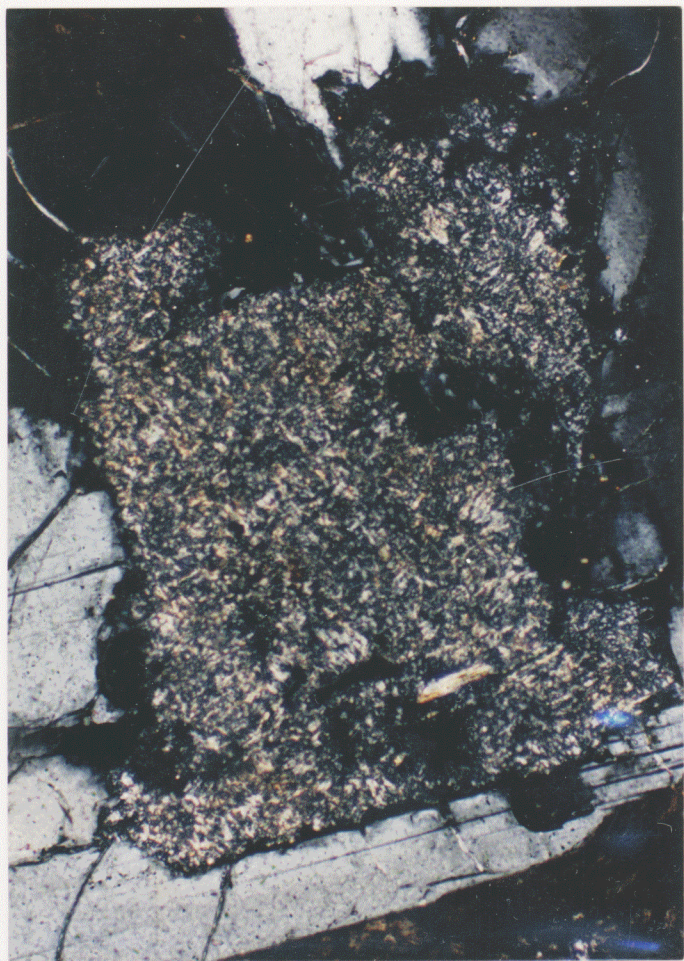
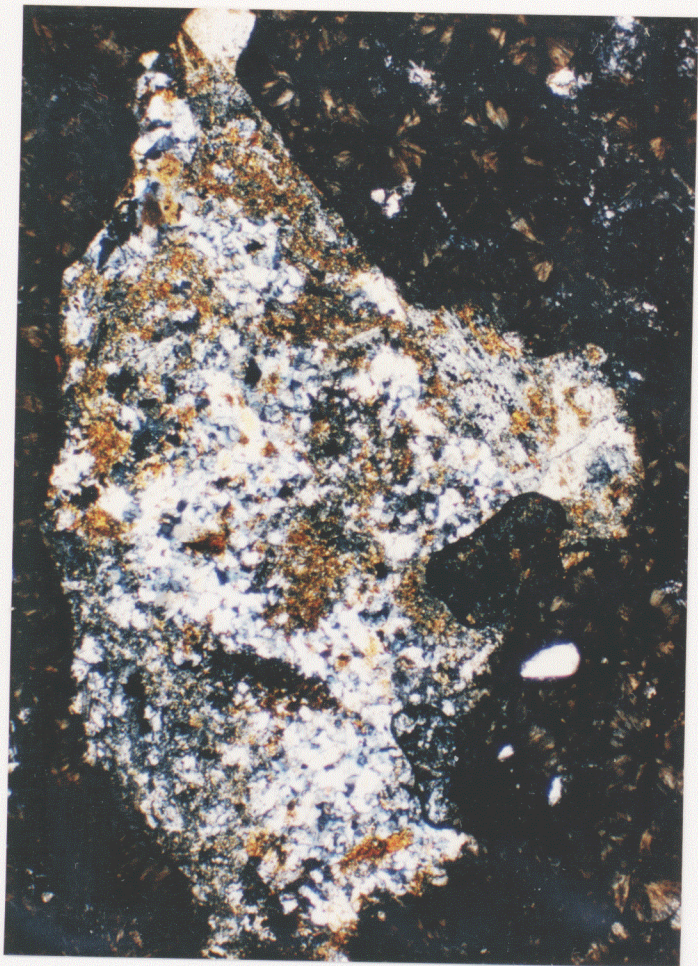
Film: Kodacolor Gold 100

Photo No.	Sample No. and description	Obj.	FOV	Light
	PUE1-ECP-1-TS2			
17	Groundmass - closeup of gte-feld intergrowths + feldspar spherulites. Notice spherulites nucleating on phenocrysts.	10x	1.7mm	XN
18	Same as #17	10x	1.7mm	PL
19	Feldspar phenocryst altering to clay at core.	4x	30mm	XN
20	Same as #19. Notice eutaxitic texture	4x	30mm	PL
21	Closeup of clay alteration at core of feldspar phenocryst shown in #19	10x	1.7mm	XN
22	Lithoclast of metamorphic gte	4x	30mm	XN
23	Biotite, gte, and opaques in groundmass	4x	30mm	XN
24	Same as #23. Eutaxitic texture	4x	30mm	PL









MESA - ECP-1

PETROGRAPHY

Sample No.: MESA-ECP-1-TS1

Locality: Sierra Pena Blanca, Chihuahua, Mexico

Formation: Mesa

Classification (rock type): Lithic vitrophyre

Matrix or groundmass: 80%

vitrophyric glass

Grains or crystals: 20%

Phenocrysts:

Quartz - 3%

Feldspars - 3%

Biotite - <1%

Mafics - trace

Lithoclasts:

Pumice - 10%

Qtz-feldspar - 3%

Opaque - <1%

Texture or fabric:

Densely welded vitrophyric texture

Groundmass exhibits eutaxitic texture - glass shards welded and flattened by compaction into discoidal shape, more or less parallel to depositional plane.

Alteration/Mineralization:

Some alteration of silicious phenocrysts (feldspars) and lithoclasts to clay

Volcanic processes or depositional origin:

Pyroclastic air fall or flow.

PETROGRAPHY

Sample No.: MESA-ECP-1-TS2

Locality: Sierra Para Blanca, Chihuahua, Mexico

Formation: Mesa

Classification (rock type): Lithic vitrophyre

Matrix or groundmass: 75%

Vitrophyric glass

Grains or crystals: 25%

Phenocrysts:

Quartz - 5%

Feldspar - 3%

Biotite - <1%

Micas - trace

Lithoclasts:

Pumice - 9%

Qtz-Feldspar - 2%

Opaque - <1%

Texture or fabric:

Same as MESA-ECP-1-TS1

Alteration/Mineralization:

Same as MESA-ECP-1-TS1

Volcanic processes or depositional origin:

Pyroclastic air fall or flow.

PHOTOGRAPHY

Photographer: JP

Microscope: Nikon

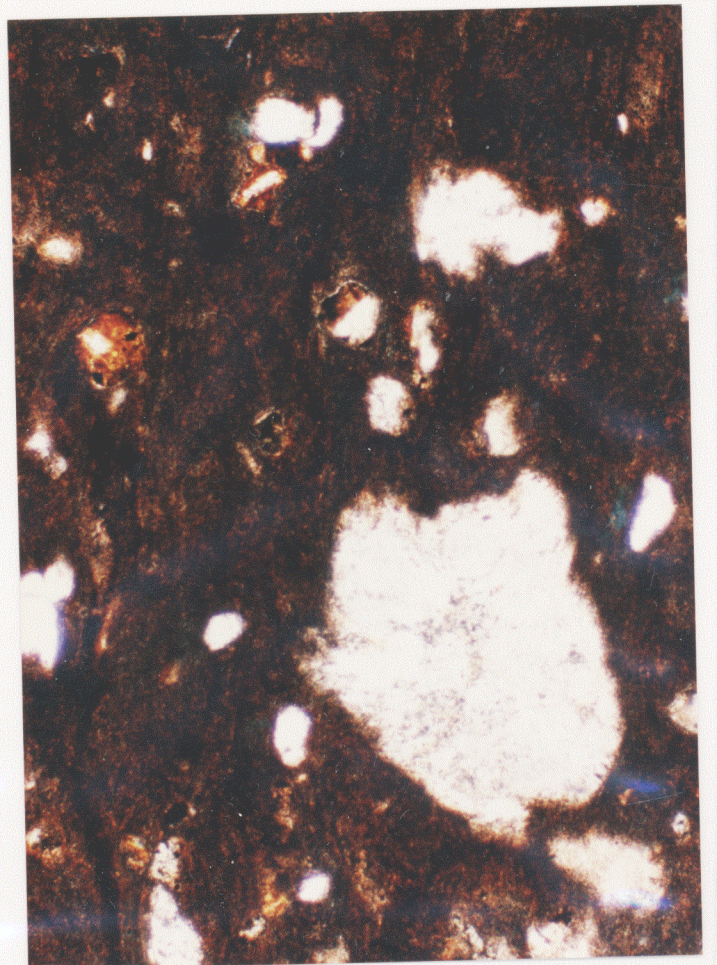
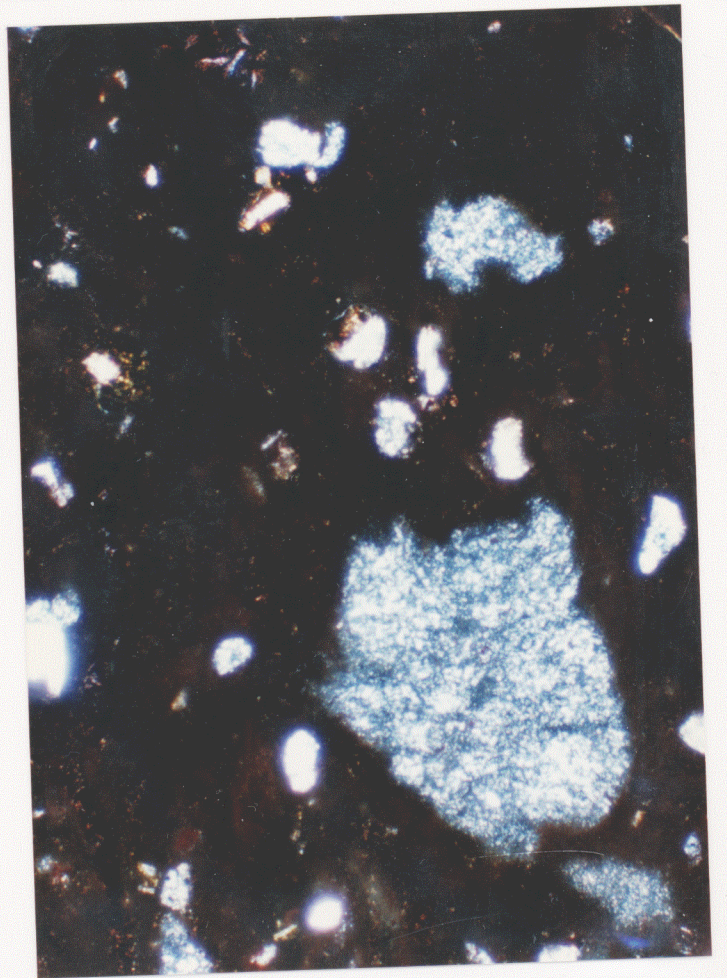
Type of photography: Standard Thin Section

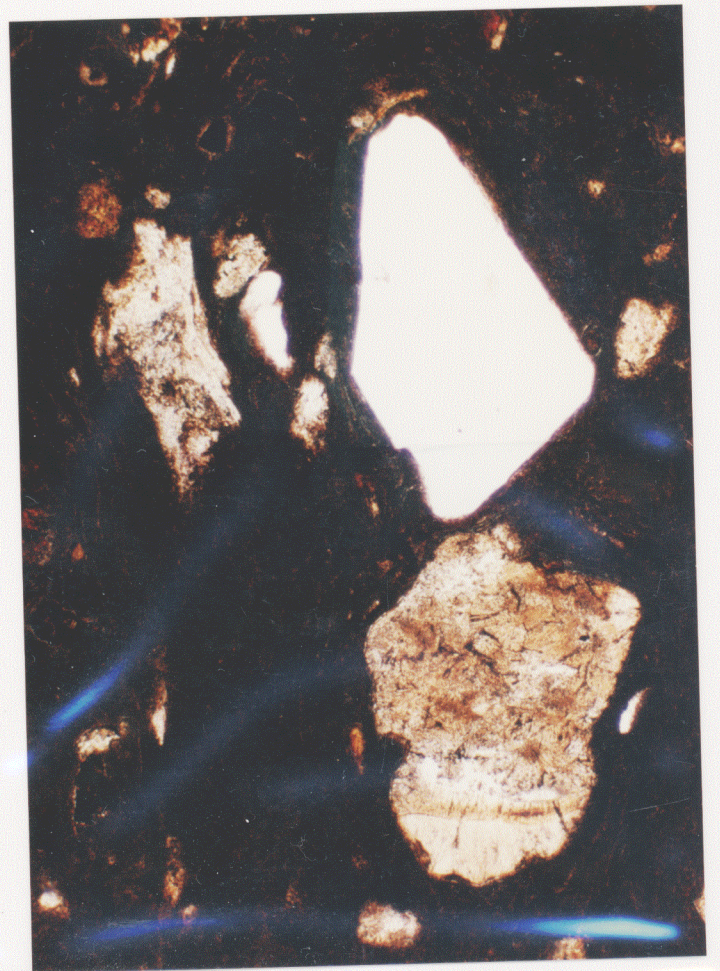
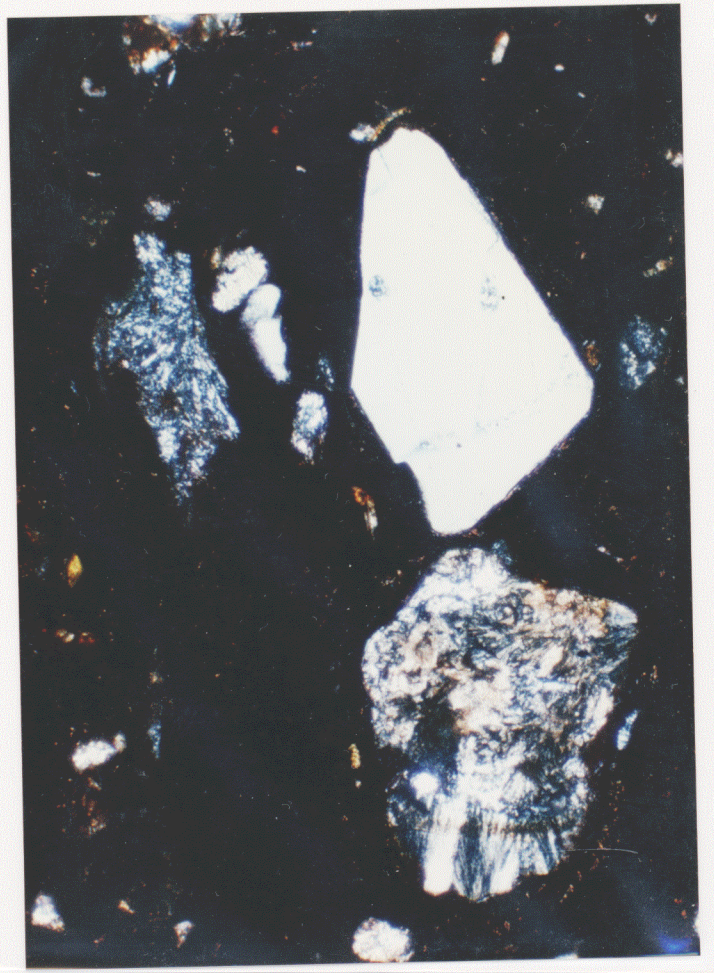
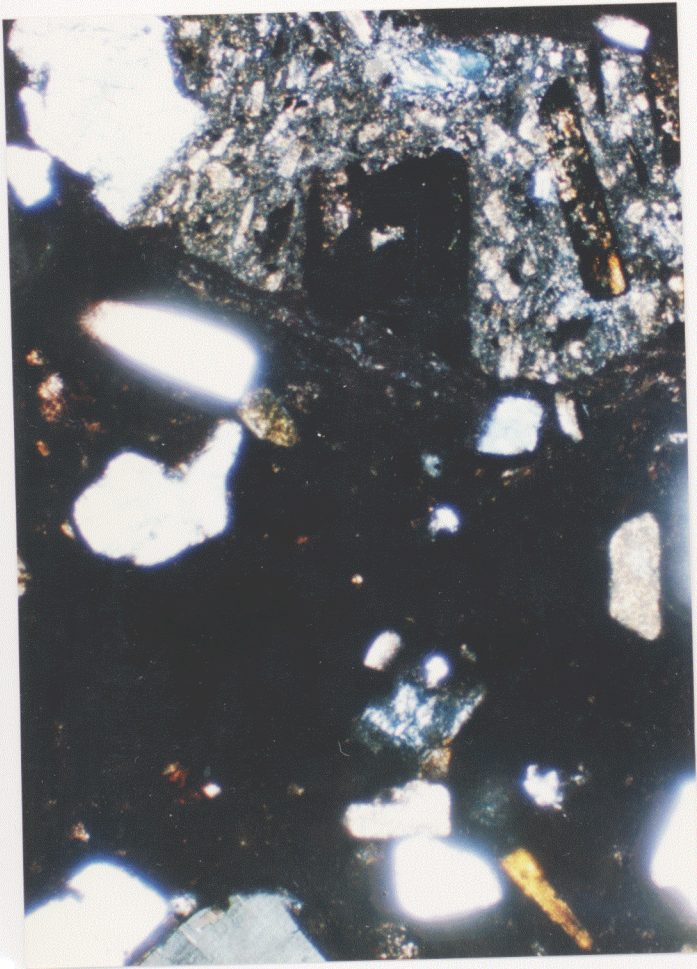
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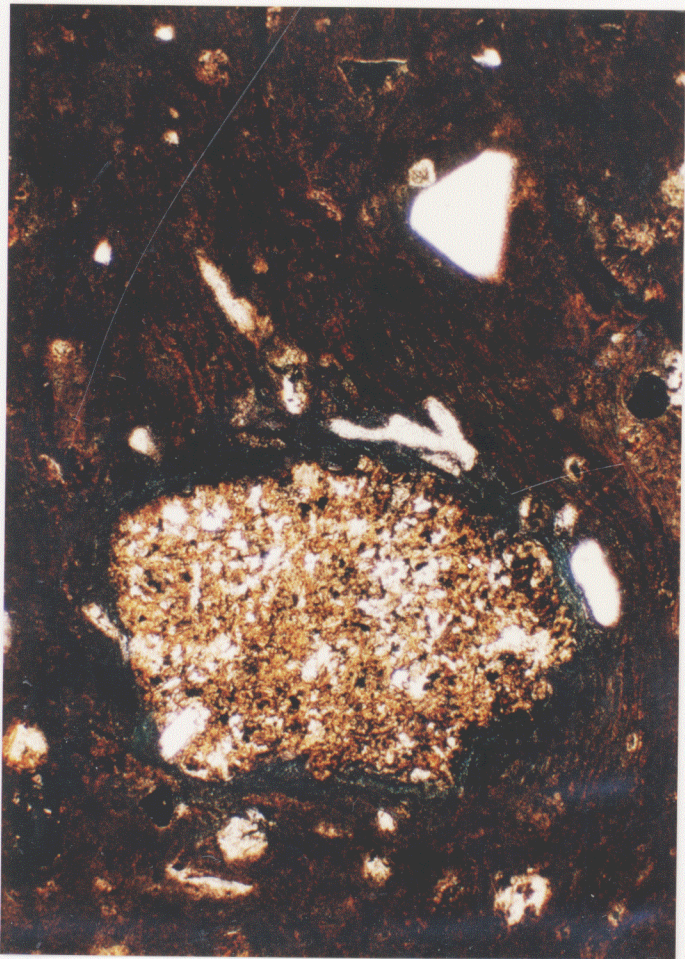
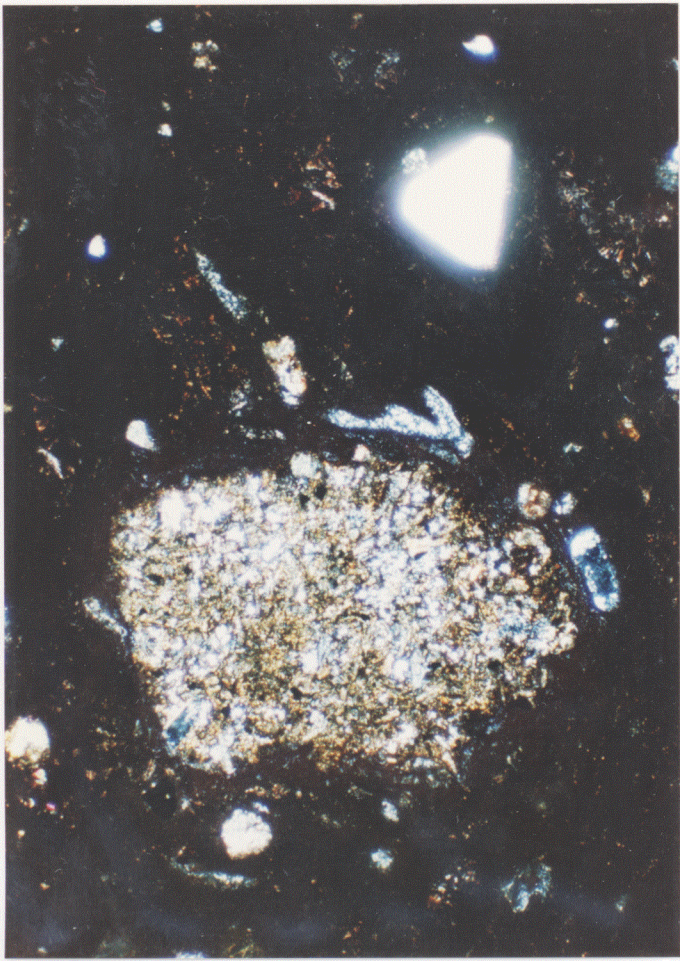
Date: 5/1/91

Film: Kodocolor Gold 100

Photo No.	Sample No. and description	Obj.	FOV	Light
1	<u>MESA-ECP-1-TS1</u> Phenocrysts in glassy groundmass. Notice eutaxitic texture.	4x	3.0mm	PL
2	Same as #1	4x	3.0mm	XN
3	Unreformed pumice fragments in glassy groundmass.	4x	3.0mm	PL
4	Same as #3	4x	3.0mm	XN
5	Lithoclast + phenocrysts in glassy groundmass	4x	3.0mm	PL
6	Same as #5	4x	3.0mm	XN
	<u>MESA-ECP-1-TS2</u>			
7	Lithoclasts + phenocrysts in glassy groundmass. Eutaxitic texture	4x	3.0mm	PL
8	Same as #7	4x	3.0mm	XN
9	Lithoclasts + phenocrysts in glassy groundmass. Eutaxitic texture. Notice alteration of lithoclast.	4x	3.0mm	PL
10	Same as #9	4x	3.0mm	XN







MESA-ECP-2

PETROGRAPHY

Sample No.: MESA-ECP-2-T51

Locality: Sierra Pena Blanca, Chihuahua, Mexico

Formation: Mesa

Classification (rock type): rhyolite vitrophyre

Matrix or groundmass: 70%

Cryptocrystalline quartz-feldspar

Grains or crystals: 30%

Phenocrysts:

Quartz - 3%

Feldspar - 2%

Biotite - <1%

Lithoclasts:

Flattened pumice - 23%

Quartz-feldspar - 1%

opaque - <1%

Texture or fabric:

Densely welded with original vitroclastic texture completely destroyed by devitrification.

Devitrification has produced a cryptocrystalline groundmass of intergrown quartz-feldspar.

Very coarse pumice fragments have been flattened along the depositional plane due to compaction however evidence for eutaxitic texture in groundmass has been obliterated by devitrification.

Alteration/Mineralization:

Devitrification of glassy groundmass to cryptocrystalline qtz-feld.

Feldspar phenocrysts have been completely altered to clays.

Pumice fragments have been altered to cryptocrystalline qtz at rim and to coarse crystalline quartz at cores.

Volcanic processes or depositional origin:

Pyroclastic airfall or flow

PETROGRAPHY

Sample No.: MESA-ECP-2-T52

Locality: Sierra Pena Blanca, Chihuahua, Mexico

Formation: Mesa

Classification (rock type): rhyolite vitrophyre

Matrix or groundmass: 70%

Cryptocrystalline *gty*-Feldspar

Grains or crystals: 30%

Phenocrysts:

Quartz - 4%

Feldspar - 2%

Biotite - <1%

Lithoclasts:

Flattened Pumice - 22%

Qtz-Feldspar - 1%

Opagus - <1%

Texture or fabric:

Same as MESA-ECP-2-T51

Alteration/Mineralization:

Same as MESA-ECP-2-T51

Volcanic processes or depositional origin:

Pyroclastic air fall or flow

PHOTOGRAPHY

Photographer: JP

Microscope: Nikon

Type of photography: Standard thin section

Camera: Nikon

Date: 5/2/91

Film: Kodak color Gold 100

Photo No. Sample No. and description Obj. FOV Light

MESA-ECP-2-TS1

11 Shows Two Flattened pumice grains. 4x 30mm XN
 in groundmass of cryptocrystalline
 Qtz feldspar with phenocrysts of Qtz
 + feldspar. Notice alteration of feldspar
 to clay and replacement of pumice by
 Qtz.

12. Same as #11 4x 3.0mm PL

13 Shows a flattened pumice fragment 4x 3.0mm XN
 in groundmass. Notice alteration of
 pumice + feldspar phenocrysts.

14 Same as #13 4x 3.0mm PL

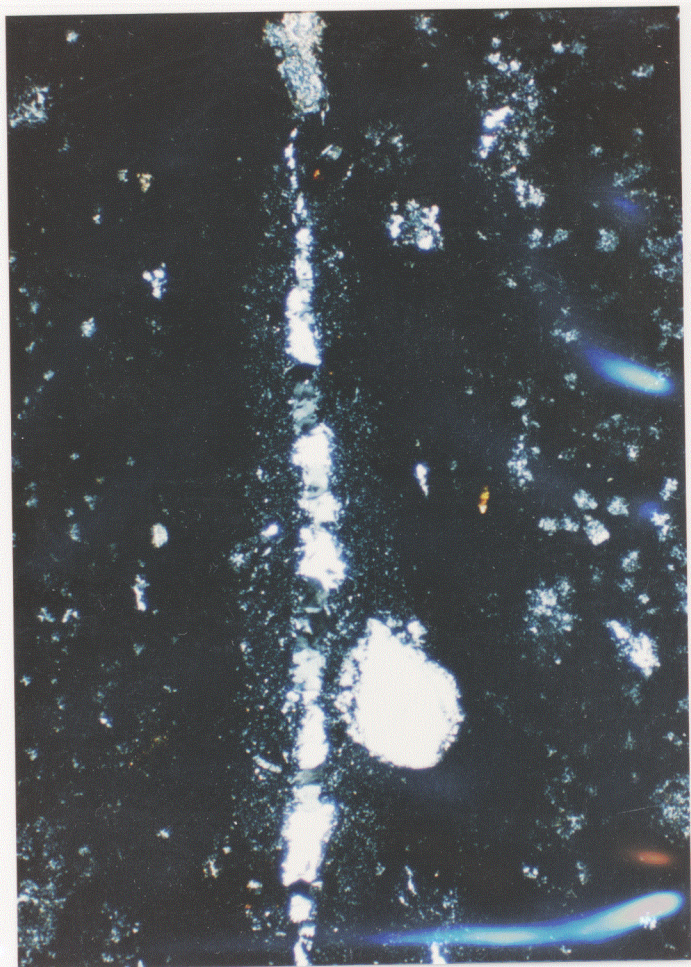
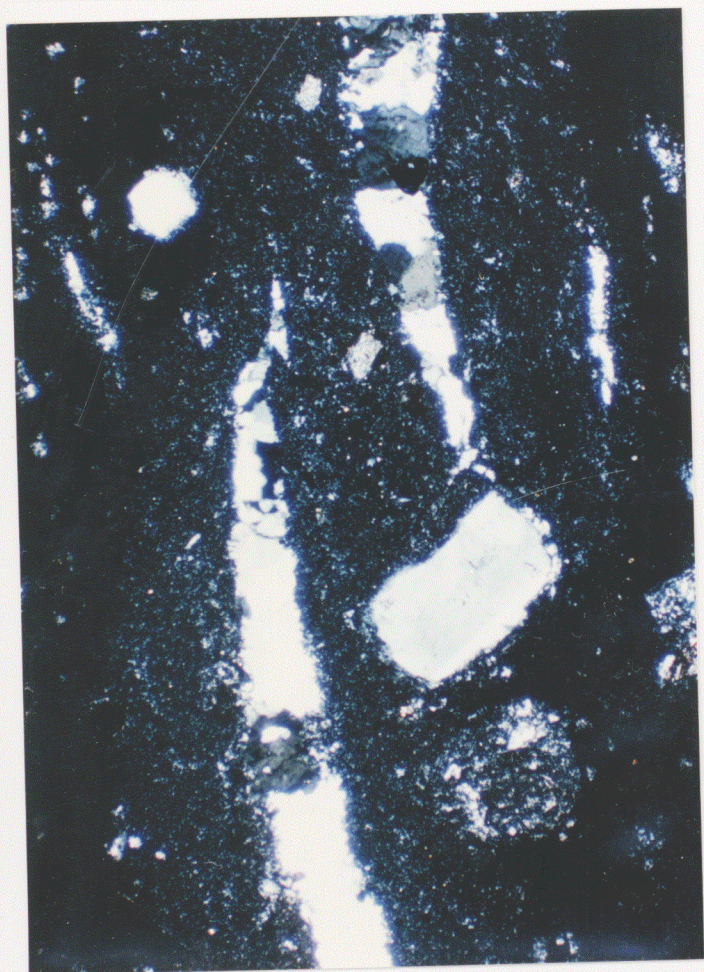
MESA-ECP-2-TS2

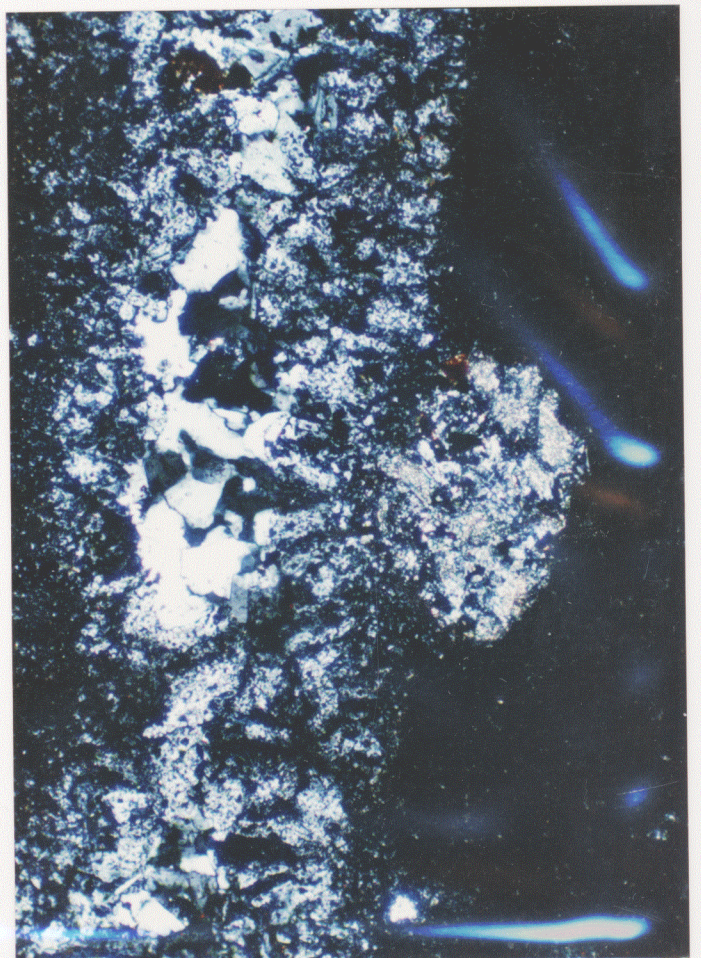
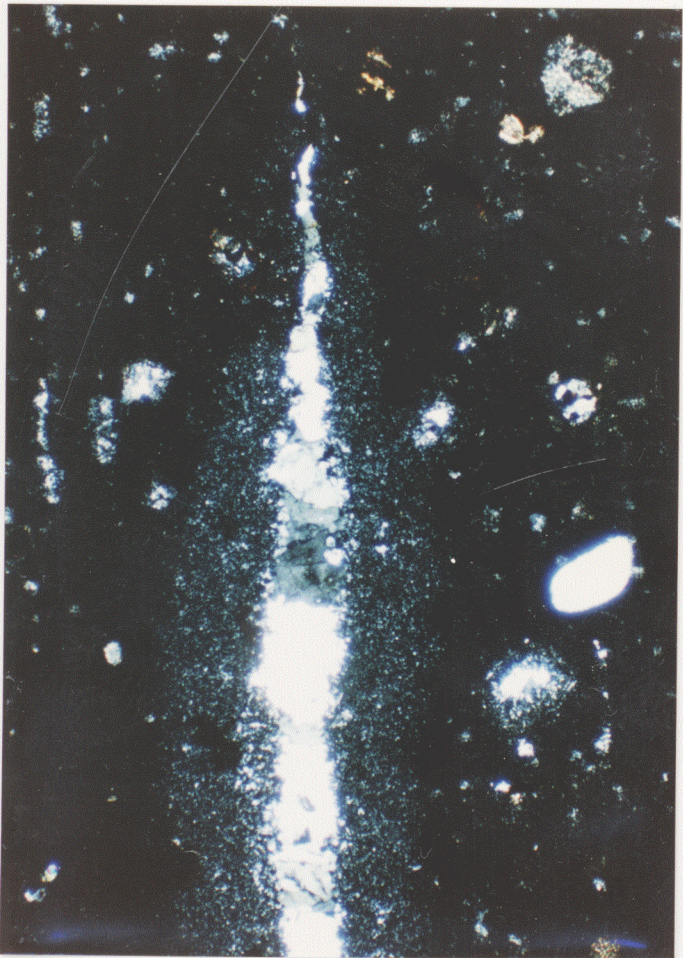
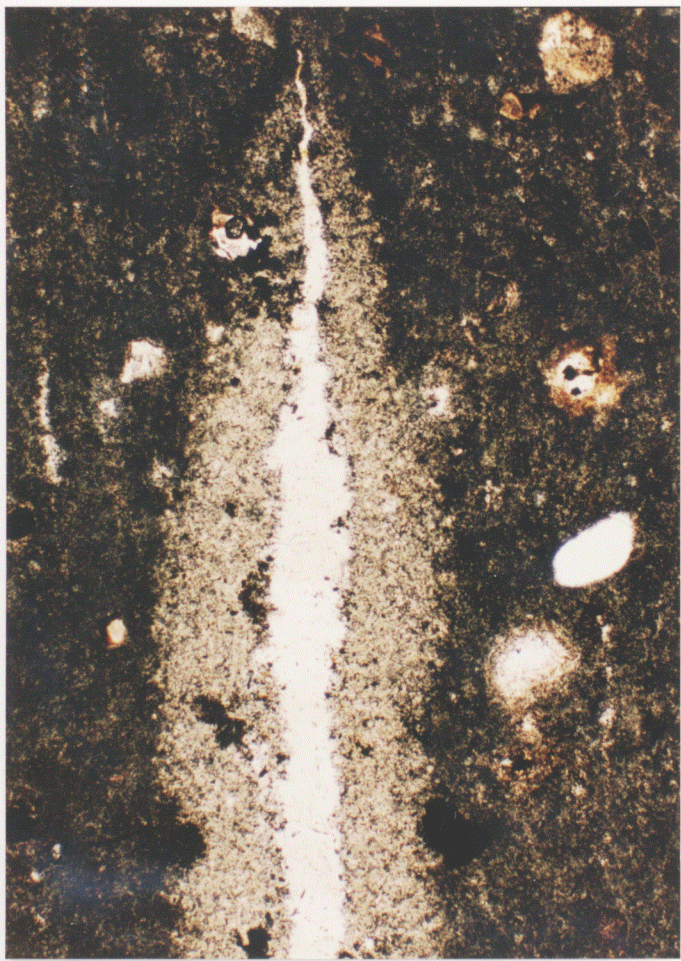
15 Flattened pumice in fine 4x 3.0mm XN
 crystalline groundmass

16 Same as #15 4x 3.0mm PL

17 Close up of altered pumice 10x 1.7mm XN
 fragment and feldspar
 phenocryst.

18 Same as #17 10x 1.7mm PL





MESA-ECP-3

PETROGRAPHY

Sample No.: MESA-ECP-3-TS1

Locality: Sierra Para Blanca, Chihuahua, Mexico

Formation: Mesa

Classification (rock type): recrystallized or metamorphosed rhyolite tuff or vitrophyre.

Matrix or groundmass: 90%
Microcrystalline gty-feldspar

Grains or crystals: 10%

Phenocrysts:

Quartz - 1%
Feldspar - 1%

Lithoclasts:

Pumice - 8%

Texture or fabric:

Densely welded with original texture obliterated by devitrification followed by recrystallization or metamorphism.

Devitrification produced a groundmass of cryptocrystalline gty-feld.

The groundmass now has a grainoblastic texture consisting of a mosaic of equidimensional anhedral grains composed of microcrystalline gty-feldspar. This suggests low-grade metamorphism.

Pumice fragments are flattened and have rims of microcrystalline quartz & cores of coarse crystalline quartz.

Alteration/Mineralization:

Devitrification of glass to cryptocrystalline gty-feld.

Recrystallization results in a grainoblastic texture.

Volcanic processes or depositional origin:

Pyroclastic air fall or flow.

PETROGRAPHY

Sample No.: MESA-ECP-3-TS2

Locality: Sierra Para Blanca, Chihuahua, Mexico

Formation: Mesa

Classification (rock type): recrystallized or metamorphosed rhyolite tuff or
vitrophyre

Matrix or groundmass: 90%

Microcrystalline gty-feldspar

Grains or crystals: 10%

Phenocrysts:

Quartz - 1%

Feldspar - 1%

Lithoclasts:

Pumice - 8%

Texture or fabric:

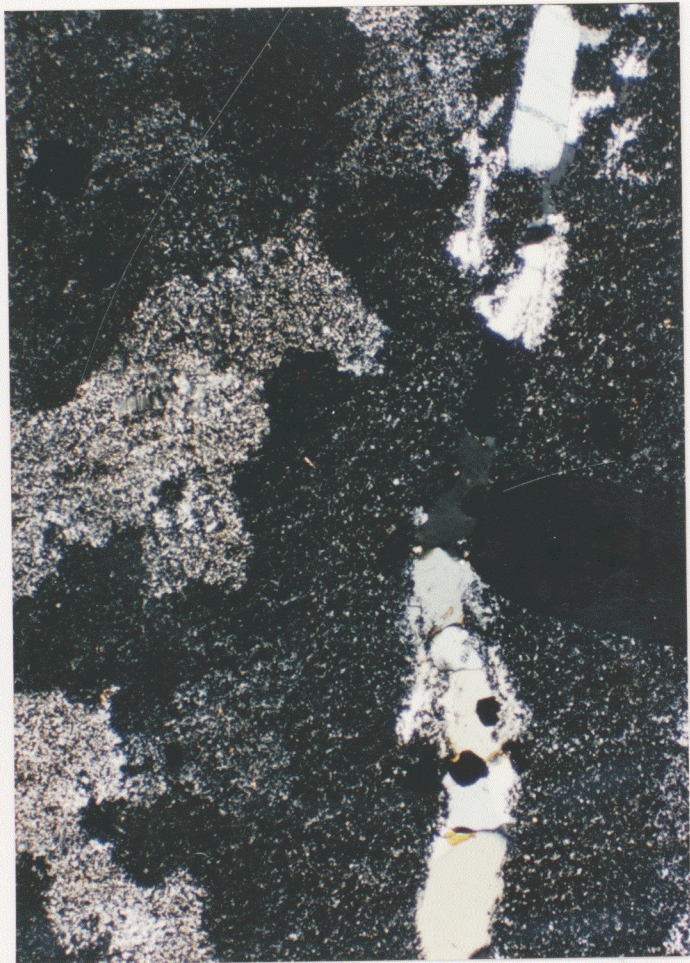
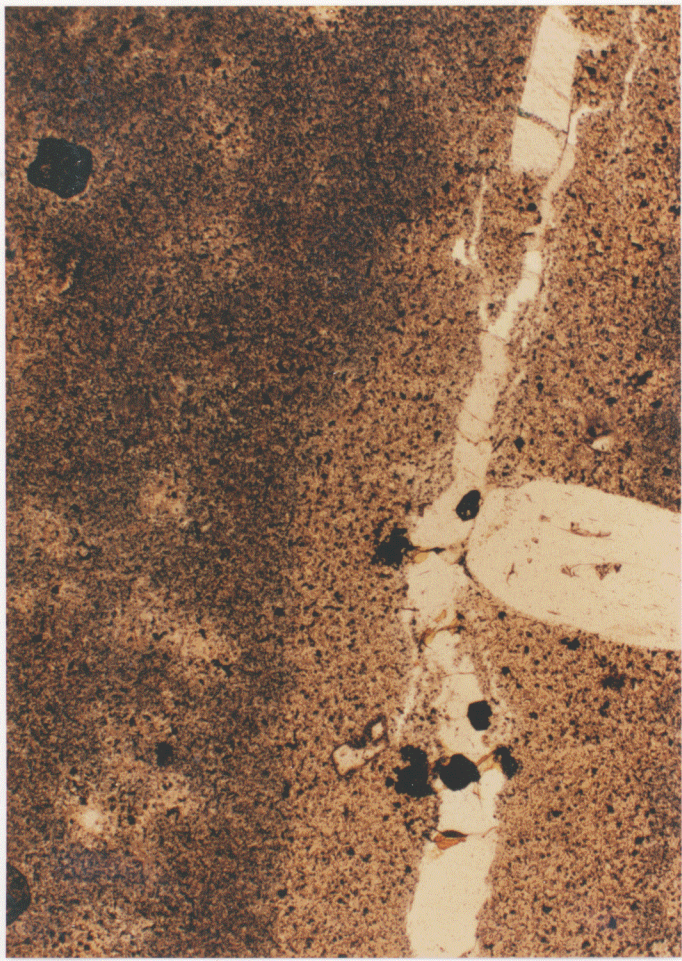
Same as MESA-ECP-3-TS1

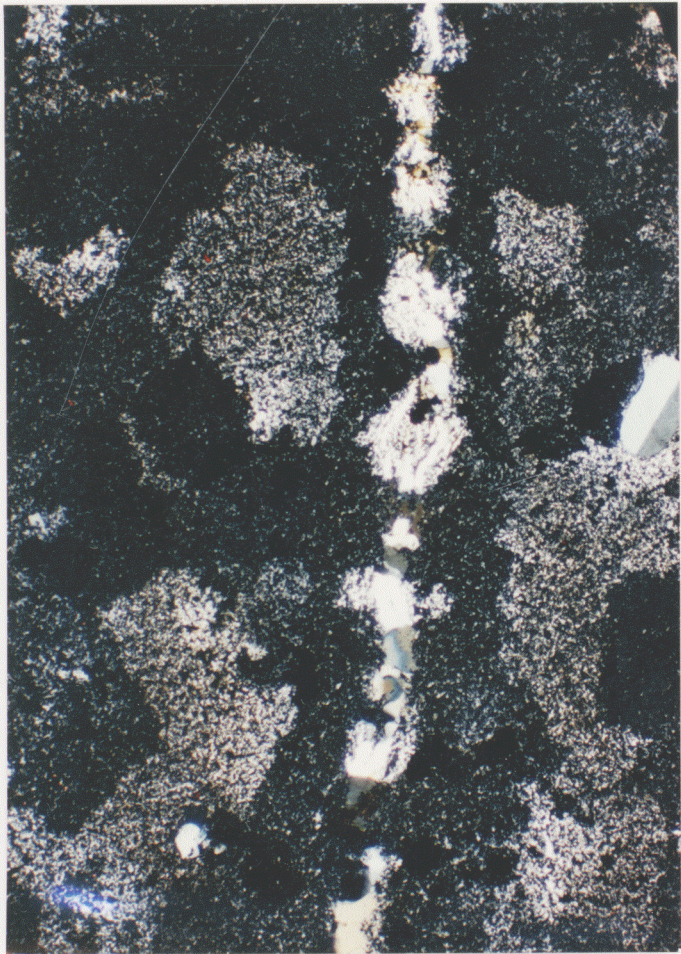
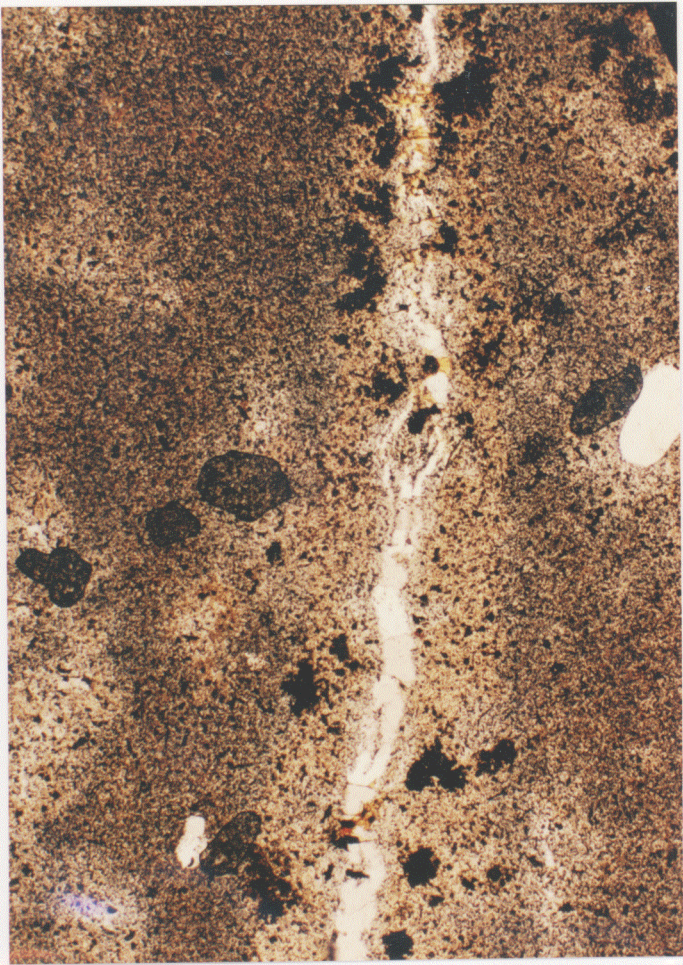
Alteration/Mineralization:

Same as MESA-ECP-3-TS1

Volcanic processes or depositional origin:

Pyroclastic air fall or flow





PETROGRAPHY

Sample No.: PB-ECP-1-TS1

Locality: Sierra Pena Blanca, Chihuahua, Mexico

Formation: Pena Blanca

Classification (rock type): rhyolitic vitroclastic tuff

Matrix or groundmass: 60%
cryptocrystalline qtz-feldspar
chalcedony

Grains or crystals: 40%

Phenocrysts:

Otz - 20%

Feldspar - 10%

Biotite - 1%

Lithoclasts:

Opaque - 2%

VRFs - 3%

MRFs - 2%

SRF - 1%

Texture or fabric:

Nonwelded, vitroclastic texture is preserved although glass has undergone devitrification to cryptocrystalline quartz-feldspar. Glass shards have been replaced by chalcedony but texture preserved. Eutaxitic texture - some glass shards flattened parallel to depositional plane by compaction.

Alteration/Mineralization:

Devitrification of glass groundmass to cryptocrystalline qtz-feldspar and chalcedony.

Feldspar altered either partially or wholly to calcite, iron oxides and opaque mineral also forming. It seems to be associated with calcification of feldspar. Feldspar also altering to clay.

Volcanic processes or depositional origin:

Clastic air fall tuff.

PETROGRAPHY

Sample No.: PB-ECP-1-TS2

Locality: Sierra Pena Blanca, Chihuahua, Mexico

Formation: Pena Blanca

Classification (rock type): rhyolitic vitroclastic tuff

Matrix or groundmass: 60%
cryptocrystalline Qtz-Feld
chalcedony

Grains or crystals: 40%

Phenocrysts:

Qtz - 20%
Feldspar - 10%
Biotite - 1%

Lithoclasts:

URFs - 3%
SRFs - 3%
MRFs - 2%

Texture or fabric:

Same as PB-ECP-1-TS1

Alteration/Mineralization:

Same as PB-ECP-1-TS1

Volcanic processes or depositional origin:

Clastic air fall

PHOTOGRAPHY

Photographer: JP

Microscope: Nikon

Type of photography: Thin section
(standard)

Camera: Nikon

Date: 5/2/91

Film: Ektar 125

Photo No.	Sample No. and description	Obj.	FOV	Light
<u>PB-ECP-1-TS1</u>				
1	Phenocrysts + lithoclasts in a devitrified groundmass. Eutaxitic texture, alteration to calcite of feldspars.	4x	3mm	XN
2	Same as #1	4x	3mm	PL
3	Closeup of groundmass - glass shards replaced by chalcedony + cryptocrystalline Qtz - Feld.	10x	1.7mm	XN
4	Same as #3	10x	1.7mm	PL
5	Calcite + clay replacing a feldspar	10x	1.7mm	XN
6	Calcite + opaques precipitating in pore space.	10x	1.7mm	XN

PHOTOGRAPHY

Photographer: *JF*

Microscope: *Nikon*

Type of photography: *Standard Thin Section*

Camera: *Nikon*

Date: *5/2/91*

Film: *Ektar 125*

Photo No. Sample No. and description Obj. FOV Light

Photo No.	Sample No. and description	Obj.	FOV	Light
	<i>PB-ECP-1-TS2</i>			
<i>7</i>	<i>Phenocrysts + clasts in devitrified groundmass. VRF, Pumice, calcite alteration</i>	<i>4x</i>	<i>30mm</i>	<i>XN</i>
<i>8</i>	<i>Same as #7</i>	<i>4x</i>	<i>30mm</i>	<i>PL</i>
<i>9</i>	<i>Alteration of feldspar to calcite + clay.</i>	<i>10x</i>	<i>1.7mm</i>	<i>XN</i>
<i>10</i>	<i>Phenocrysts + lithics in devitrified groundmass. Alteration.</i>	<i>4x</i>	<i>3.0mm</i>	<i>XN</i>
<i>11</i>	<i>Same as #10</i>	<i>4x</i>	<i>3.0mm</i>	<i>PL</i>
<i>12</i>	<i>Phenocryst + Fragments in devitrified groundmass</i>	<i>4x</i>	<i>3.0mm</i>	<i>XN</i>

