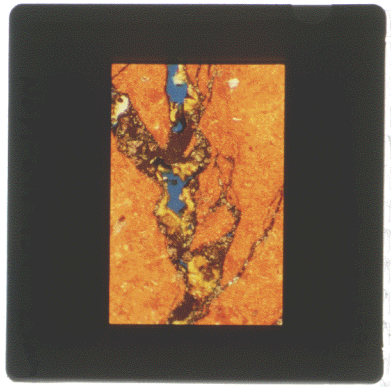
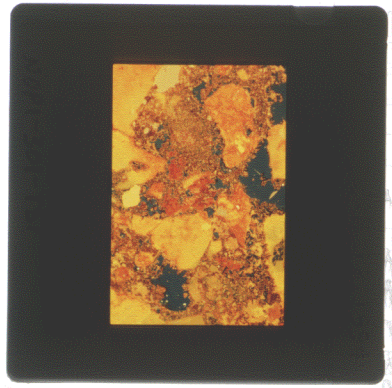
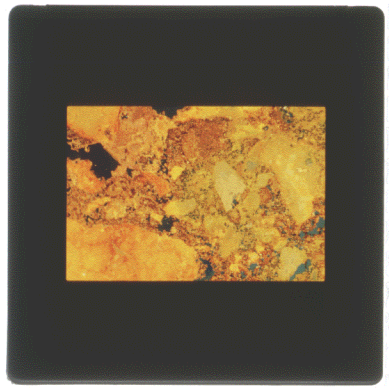
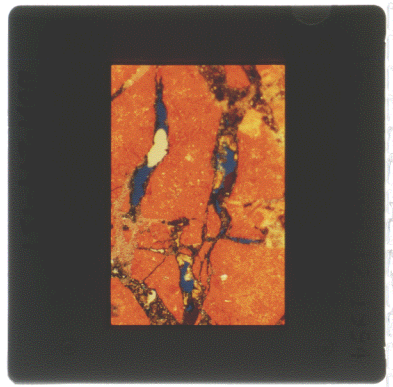
ANALYSES OF FE-OXIDE BEARING FRACTURES AT NOPAL I CHIHUAHUA, MEXICO

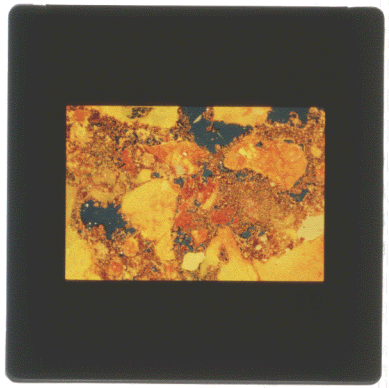
308 --- Q200406070005
Supplemental Material, Technical Activity Supporting Documentation: Experimental Data for Analyses of Fe-Oxide Bearing Fractures at Nopal I, Chihuahua, Mexico (01/07/1994 through 07/10/1994)

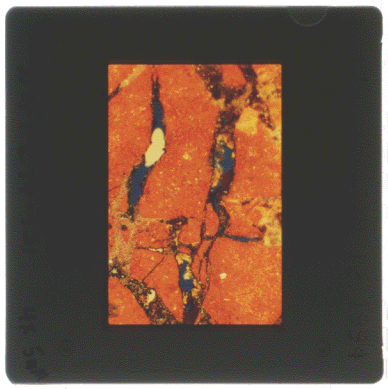












NOPI-414-TS1

NOPI-301-TS1 (61/14/10)

Sample from E/W trending fracture on +10 level. Fe-oxide rich, prominent, fracture.

Fracture fill consists of fragments of host rock cemented by iron oxides. Host rock fragments are highly altered. Bleached, kaolinitized. Fragments have undergone varying degrees of hematization, and limonitization of the matrix. Small fractures within the fragments appear to contain crystalline iron oxides. Fragments without fractures appear to have undergone less Fe-oxide alteration of matrix.

Fe-oxide cement show varying degrees of crystallinity from amorphous to totally crystalline.
Colors vary from yellow-orange to red to brown to black.
Fracture filling iron-oxides are very porous possibly due to iron-oxide ~~[illegible]~~ leaching.

NOP1-301-T31 (cont)

Overall porosity of sample is about 20%
Most porosity occurs in iron oxides which have porosities of about 40 to 50%

NOP1-301-TS1

Petrography

Host rock fragments cemented by Fe-oxides in a fracture.
Rock fragments have undergone varying degrees of hematization or limonitization from practically unaltered to strongly hematized (dark red areas).
On larger fragments alteration occurs along margin of the fragment and along fractures within fragment.
Smaller fragments are generally strongly altered throughout.

Fe-oxides in fractures consist mostly of a gray crystalline mineral which is probably goethite.
White crystalline areas are intergrown with the gray mineral and may be hematite.
Dark amorphous material is intergrown with the crystalline material - may be amorphous Fe-oxides or clay.
A gold-yellow colored transparent mineral is also intergrown with the Fe-oxides and maybe jarosite.

The fracture filling material is quite porous. Maybe leached or material did not completely fill void.

Pyrite ghosts occur in fracture suggesting pyrite replacement by Fe-oxides

NOP1-294-TS1 (-10.07/14.7/10).

Sample from prominent E/W trending iron oxide filled fracture on +10 level.

Host rock for the fracture is hematitic, red-colored matrix. Small fragments of the hematitic country rock are contained within the fracture where they are cemented by iron oxides.

The main fracture is about .4 to .8 cm wide. Smaller peripheral fractures are common and are also generally filled or coated by Fe-oxides.

Feoxides in fractures are crystalline to amorphous. Colour range from yellow-orange to red to brown to black. Where open spaces exist - colloform textures are common. A yellow crystalline transparent mineral is also common and grows from iron oxide substrate into open space - could be natrojarite or possible jarosite.

NOPI-294-TS1 (cont)

Porosity occurs in open space rimmed by Fe-oxides (i.e., rim opaques do not completely fill open fractures).

Overall porosity of fracture is about 15%. Locally (~1 cm) porosity may vary from 5% to 30% in the main fracture.

UOPI-294-TS1

Petrography

Host Tuff is very hematized - red even under plane light

Host rock has been fractured and fractures contain iron-oxides, clay, host rock fragments, and crystalline transparent mineral - possibly wulfenite or U^{+6} mineral.

Kaolinite is the main clay mineral in fractures. Maybe primary precipitate or replacement of host rock fragments.

Fe-oxides in fractures are generally crystalline and consist of hematite - white and goethite - gray. Fe-oxides sometimes have a colloform texture where open space exists. Crystalline Fe-oxides sometimes grow from a black non-crystalline material which may be amorphous Fe-oxide.

Host rock fragments in fractures often show evidence of dissolution

Porosity in fracture may result from incompletely healing of fracture by Fe-oxide or dissolution of host rock fragments

Ghost of pyrite crystals - now replaced by Fe-oxides are present suggesting that Fe is supplied by dissolution of pyrite.

Euhedral transparent crystals of wulfenite? monoclinic? grow into open spaces from Fe-oxide colloform substrates. Latest mineral.

NOP1-268-TS1 and TS2 (32.15/2.8/0)

Sample from E-W traverse on +0 level

Matrix of host rock is moderately hematized. Phenocrysts are replaced by kaolinite and/or hematite.
Phenocrysts show varying degrees of hematization from non-hematized to totally hematized.
Strong hematization of matrix occurs along fractures that emanate from the major Fe-oxide filled fracture.
~~Some~~ Many of the smaller fractures have iron-oxide coatings along margins and open centers

The main fracture ~~is~~ contains amorphous to crystalline Fe-oxides
Porosity occurs where Fe-oxide have not completely filled the fracture

Total porosity of fracture is ~~about~~ between 5 and 10 % but locally (over ~1 mm) porosity may be up to 15 to 20%.

NOP1-2168-TS1 and TS2 (cont)

Fracture appears to also contain fragments of the host rock which appears altered - kaolinized and/or hematized.

Fe-oxides show variety of colors from orange to red to brown to black. A yellow-green mineral in some fractures + open spaces may be jarosite or a mangl silicate.

Fracture vein is width from .2 to ~.8 cm.

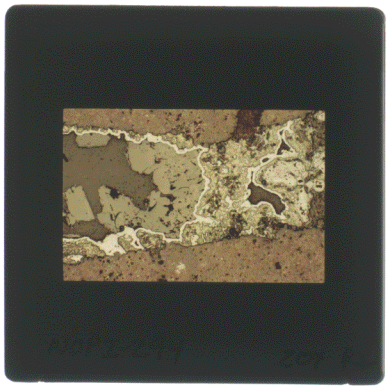
NOP1-33-TS4

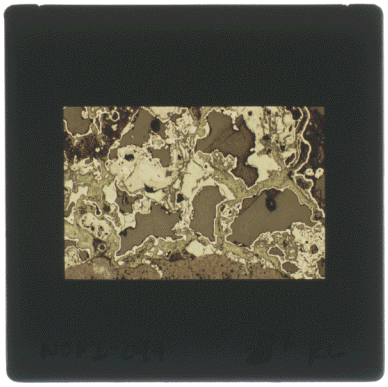
Fe-oxide rich fracture in a slightly
Ironrich host rock.
Fracture varies in width from about
.15 to .6 cm.
Fe-oxides are amorphous to crystalline
and amorphous variety appears to be
intergrown with kaolinite.
Color of Fe-oxides ranges from yellow
orange to brown. Brown Fe-oxides are
more crystalline whereas orange are
amorphous.

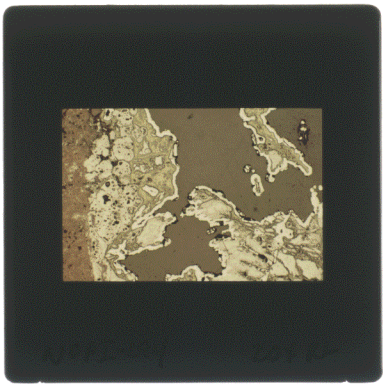
Fragments of host rock are contained
within the fracture and appear to
be altered as the host rock is.

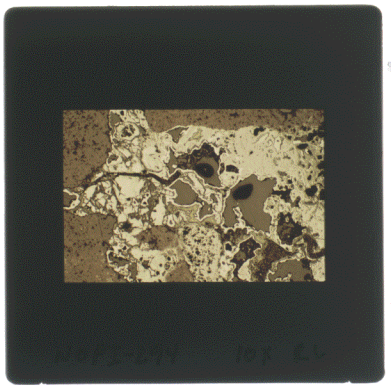
Porosity appears to occur as dissolved
crystals or host fragments. Some
fragments have clearly undergone
partial dissolution.

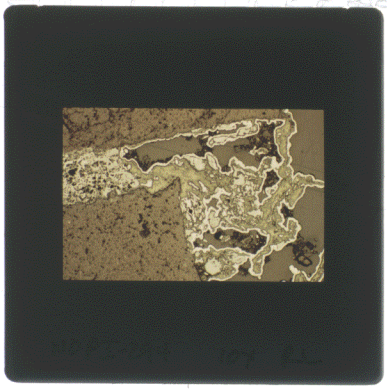
Overall porosity is about 5%.

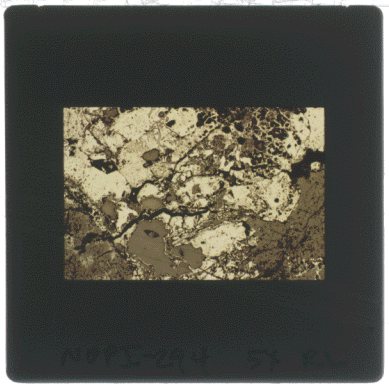


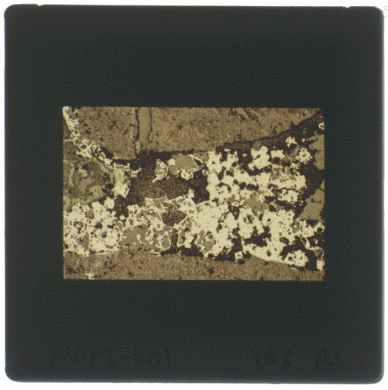


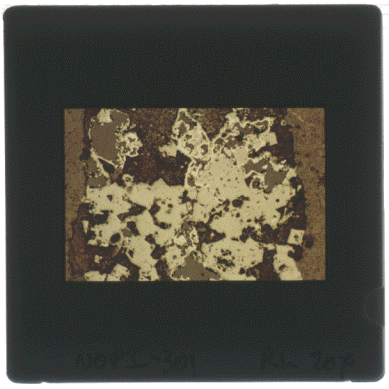


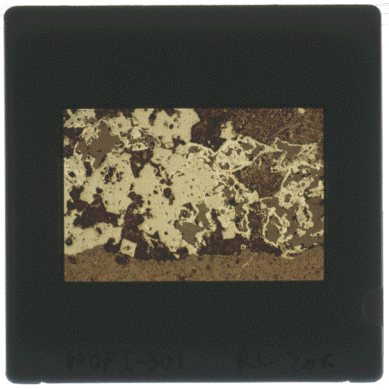


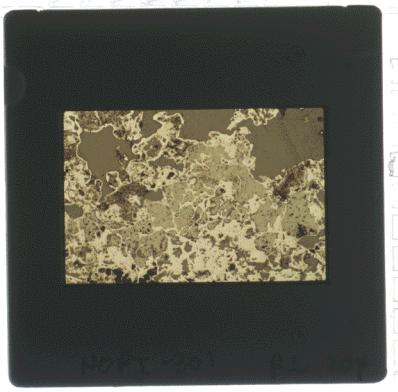


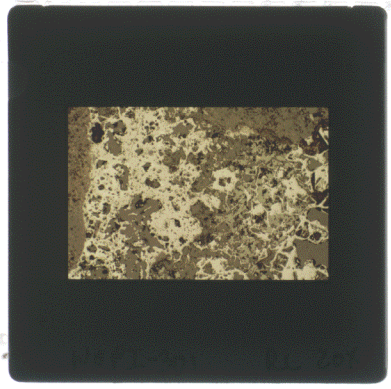


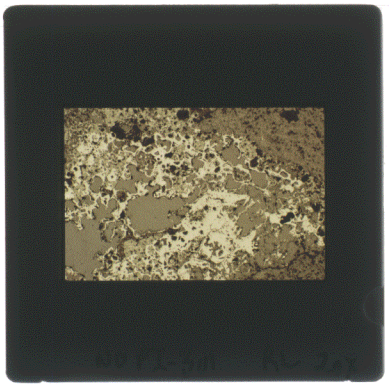


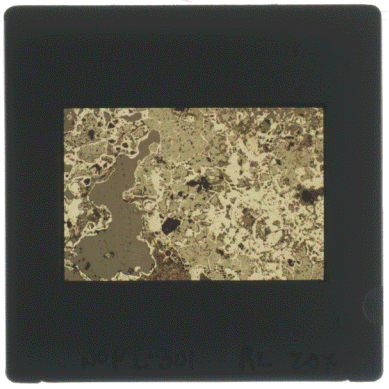


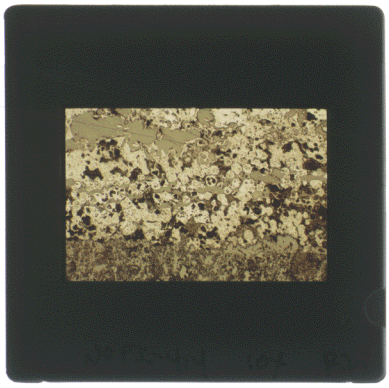


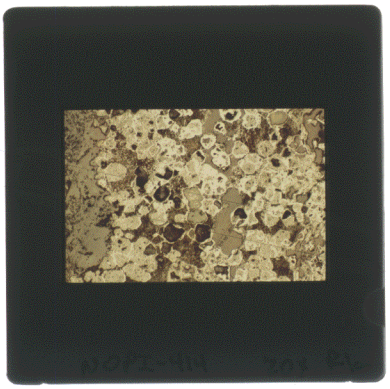


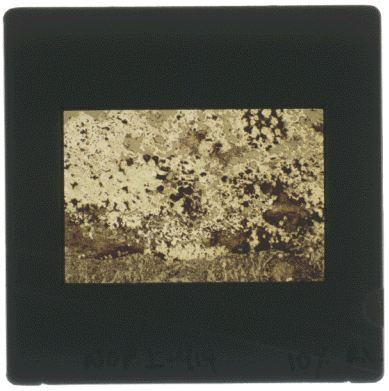


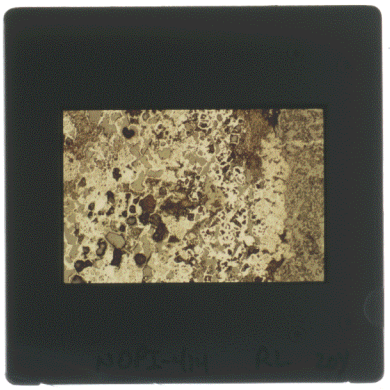


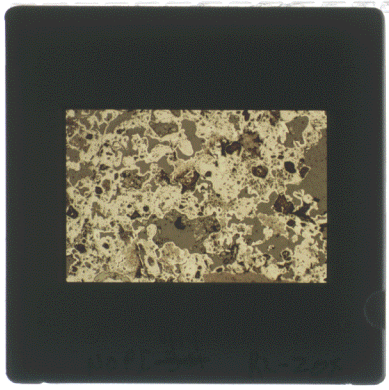


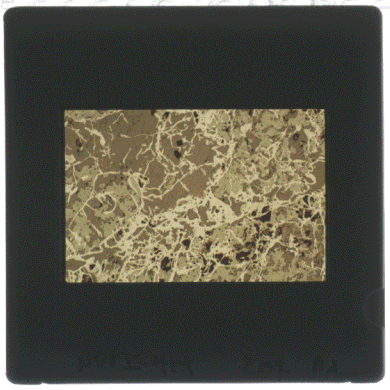


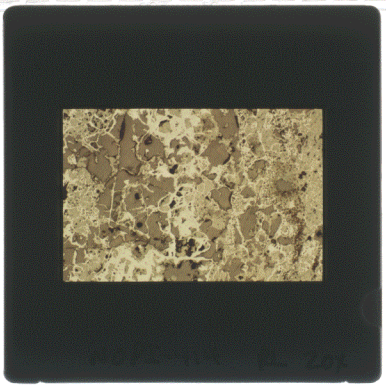


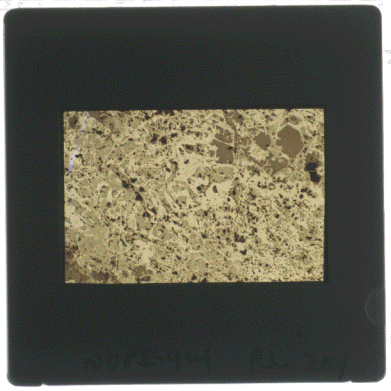


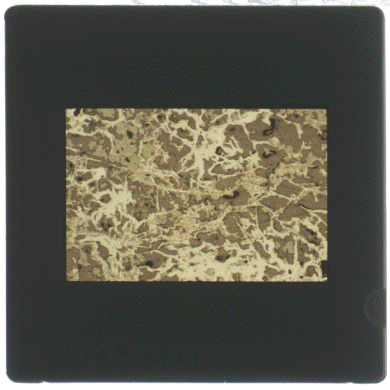












PHOTOGRAPHY

Photographer: JP

Microscope:

Type of photography:

Camera: Minolta

Date: 1/7/94

Film: 100 slide

Photo No.	Sample No. and description	Obj.	FOV	Light
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5	NOPI-268-TS2			
6	NOPI-268-TS2			
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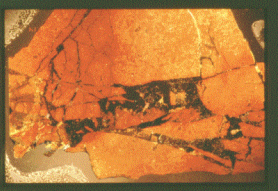
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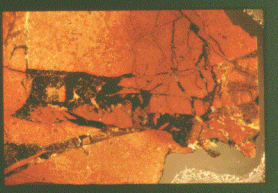

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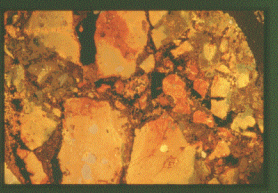
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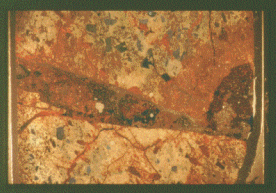
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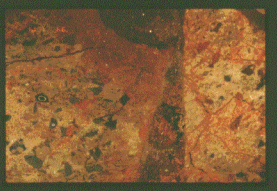
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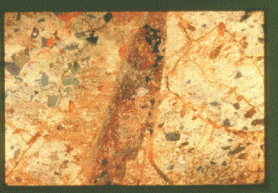
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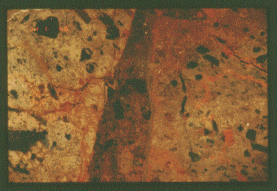
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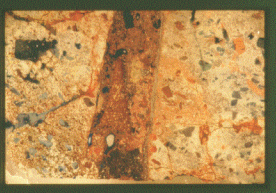
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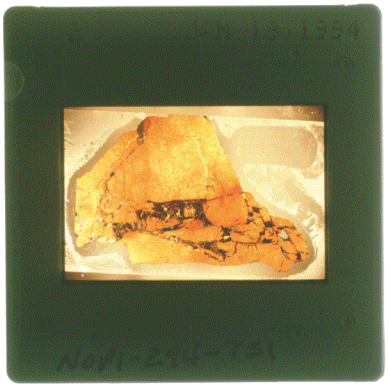
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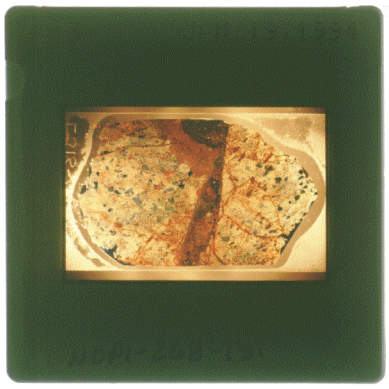
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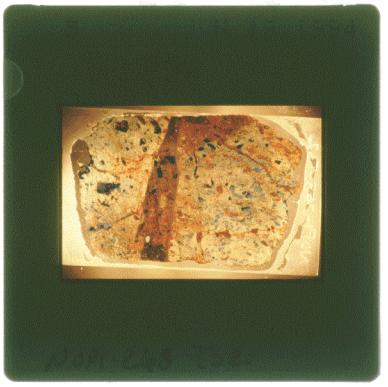
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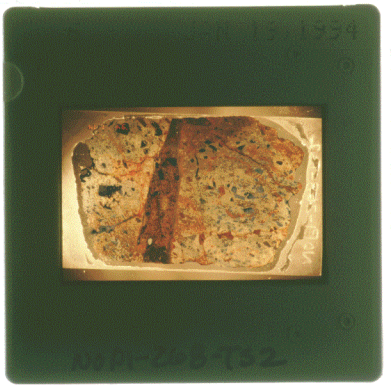
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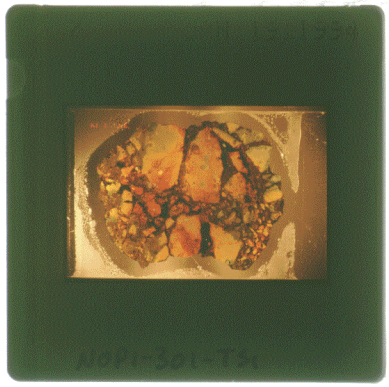
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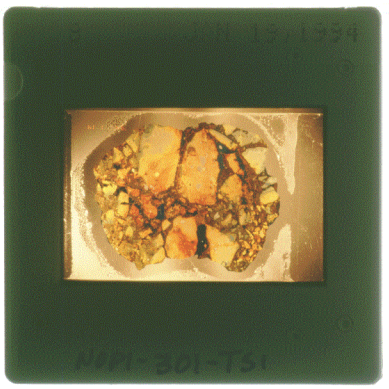
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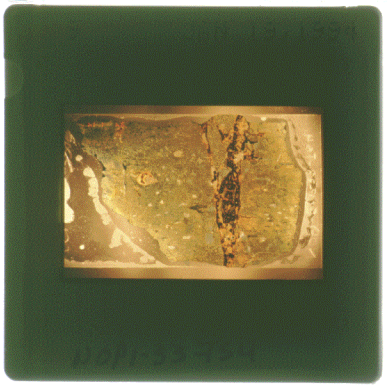
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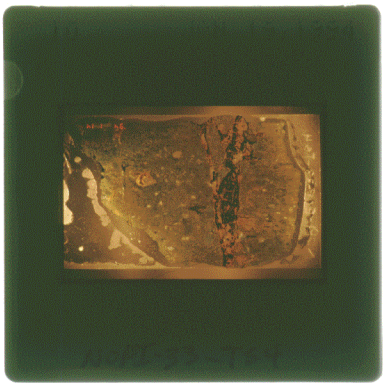
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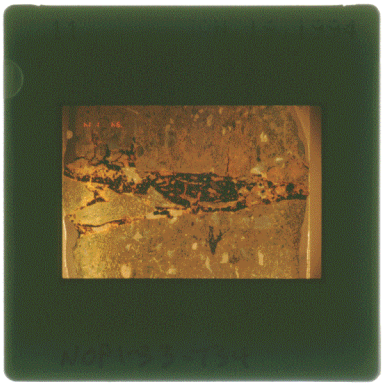
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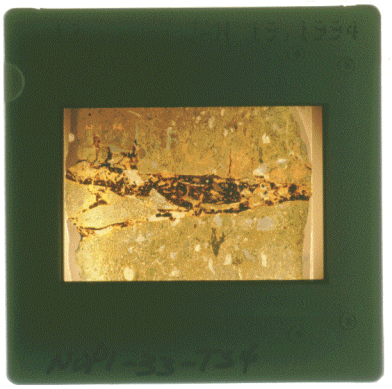

NOPI-33-T24

PHOTOGRAPHY

Photographer: JP

Type of photography:

Date: 1/10/94

Microscope: Nikon Binocular

Camera: Nikon

Film: 100 slide color

Photo No.	Sample No. and description	Obj.	FOV	Light
1	NOPI-301-TS1	1X		
2	"			
3	NOPI-301-TS1	1X		
4	"			
5	NOPI-301-TS1	2x		
6	"			
7	NOPI-301-TS1	2x		
8	"			
9	NOPI-301-TS1	4X		
10	"			
11	NOPI-301-TS1	4x		
12	"			
13	NOPI-294-TS1	1X		
14	"			
15	NOPI-294-TS1	1X		
16		1X		

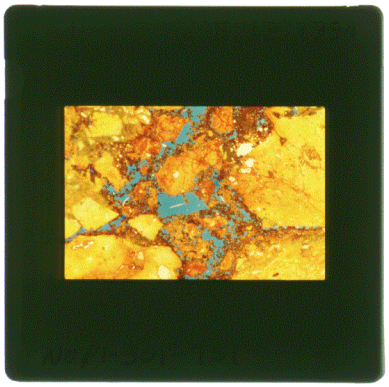
PHOTOGRAPHY

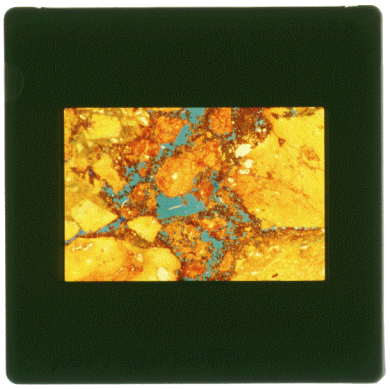
Photographer: Microscope:

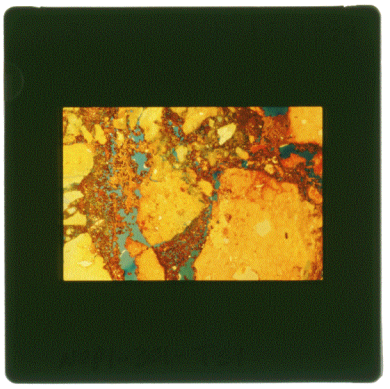
Type of photography: Camera:

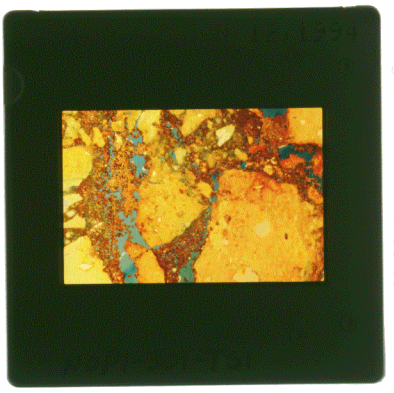
Date: 1/10/94 Film:

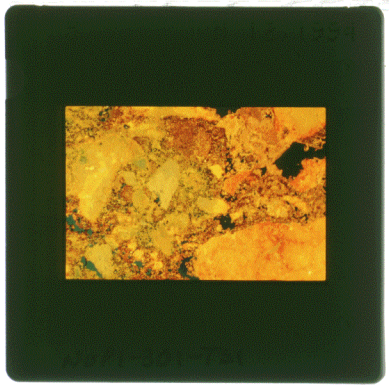
Photo No.	Sample No. and description	Obj.	FOV	Light
17	NOP1-294-TS1	4X		
18				
19	NOP1-294-TS1	4X		
20	NOP1-294-TS1	4X		
21	"	4X		
22	NOP1-294-TS1	2X		
23	NOP1-294-TS1	6.3X		
24	NOP1-294-TS1	6.3X		

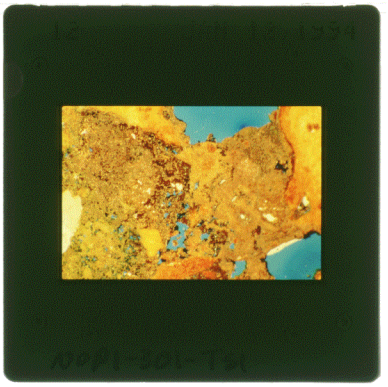


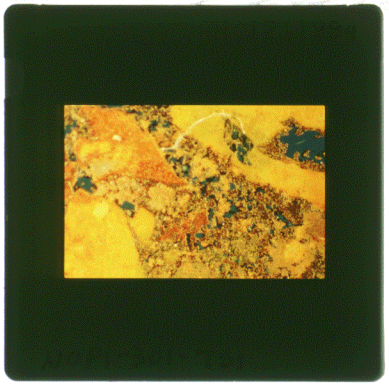


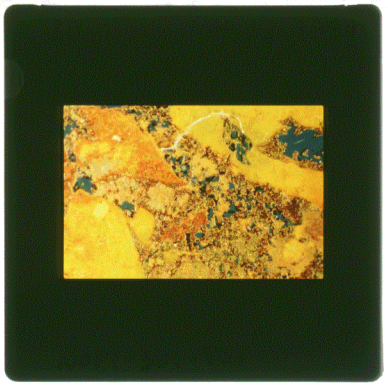


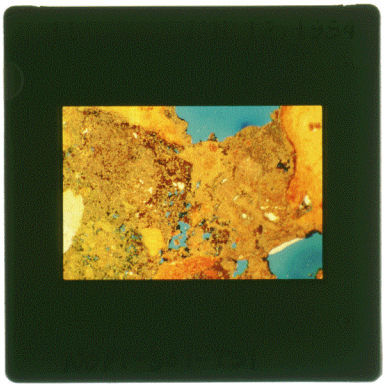


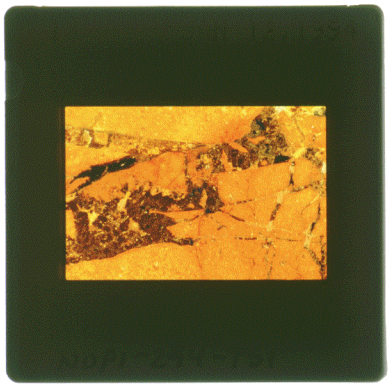


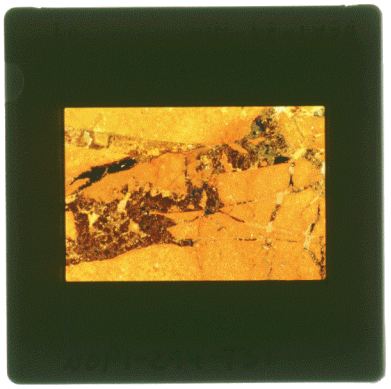


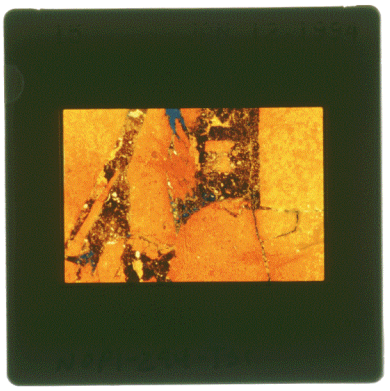


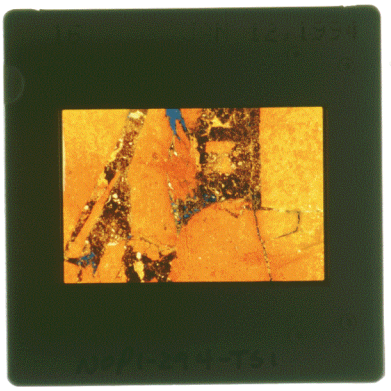


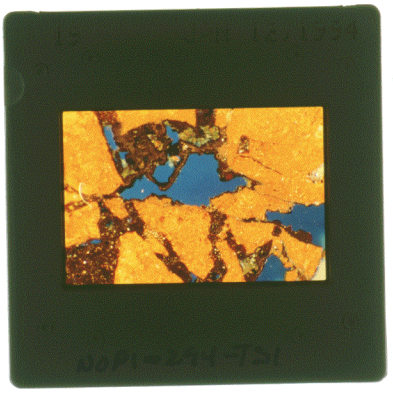


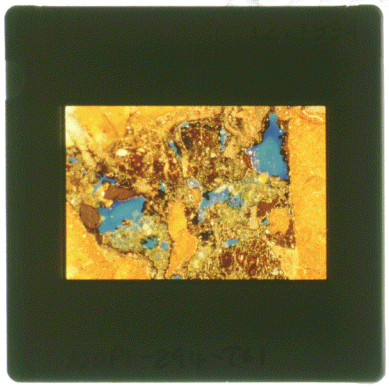


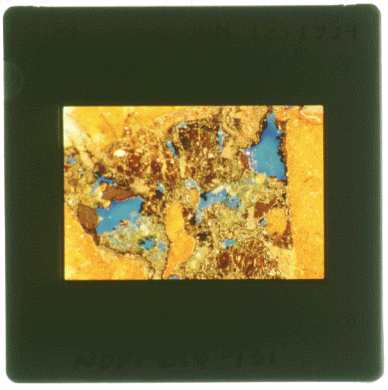


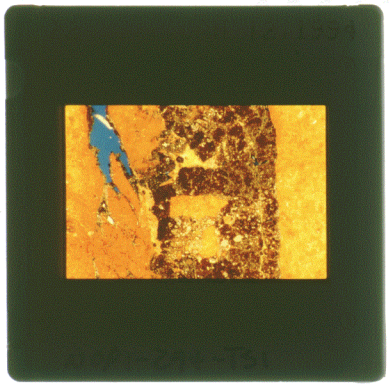


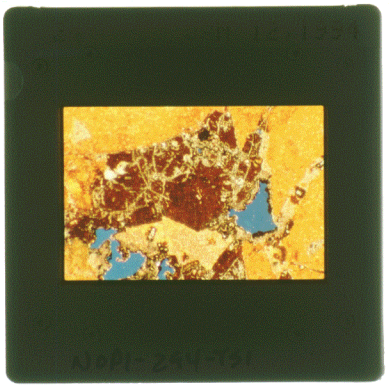












PHOTOGRAPHY

Photographer: JP

Type of photography:

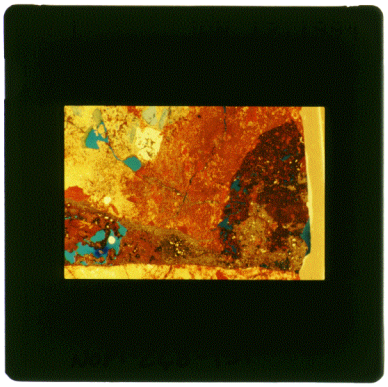
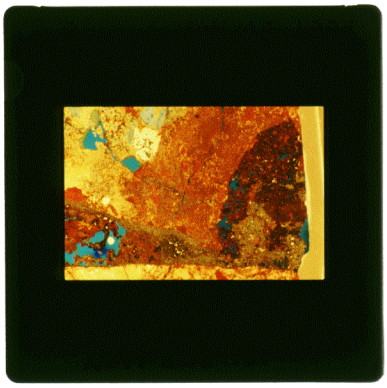
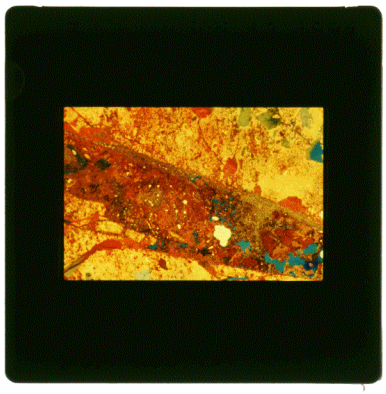
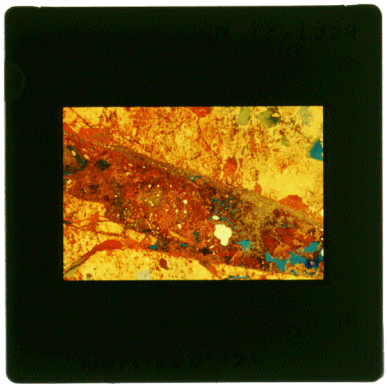
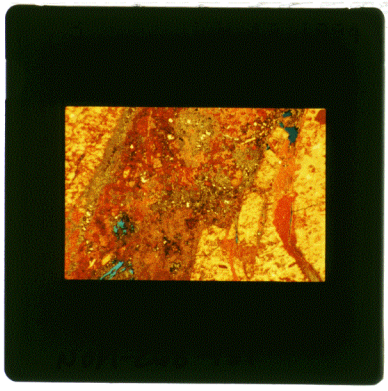
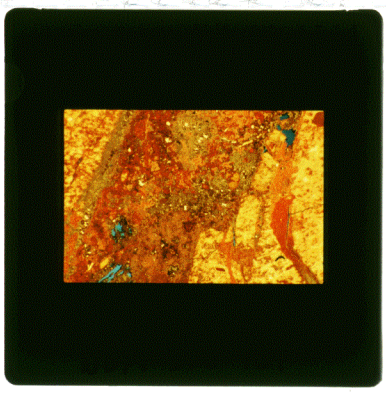
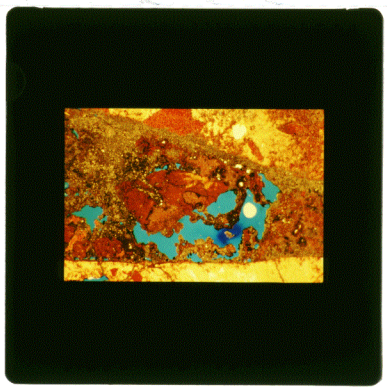
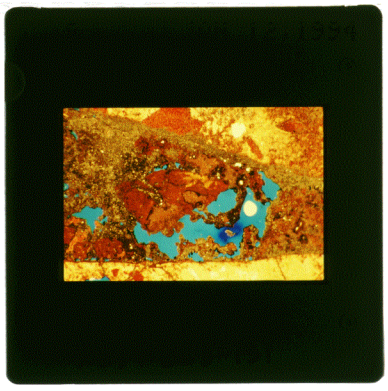
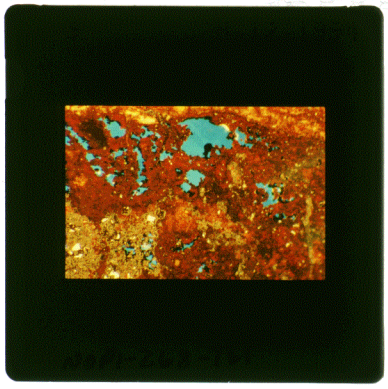
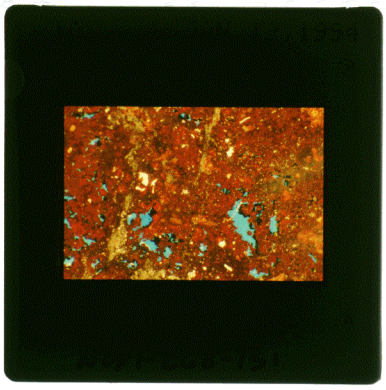
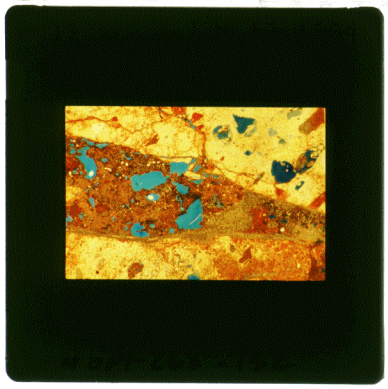
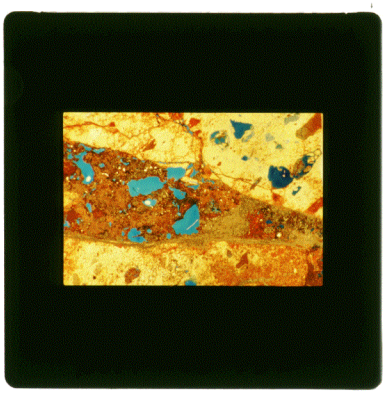
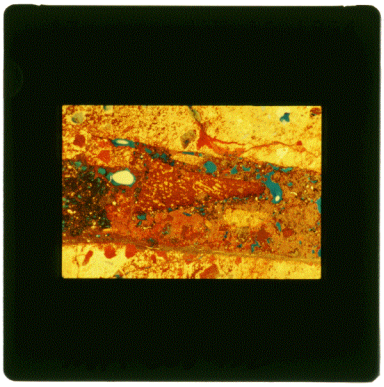
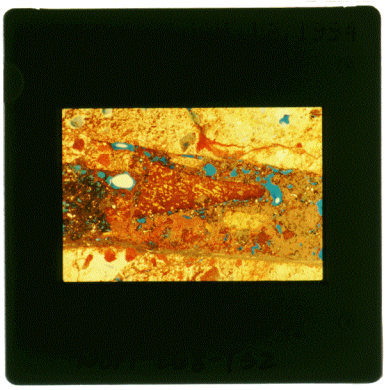
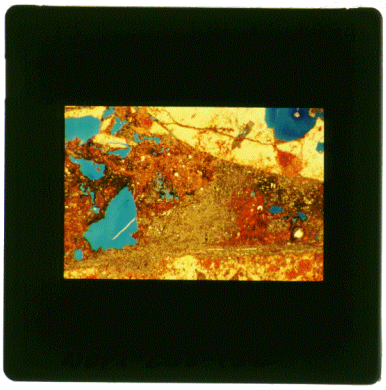
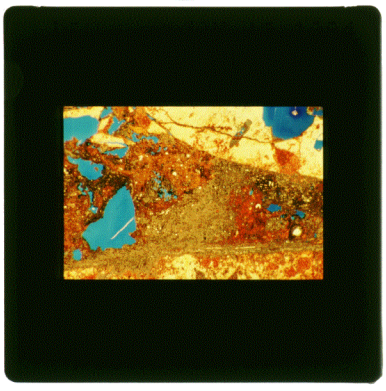
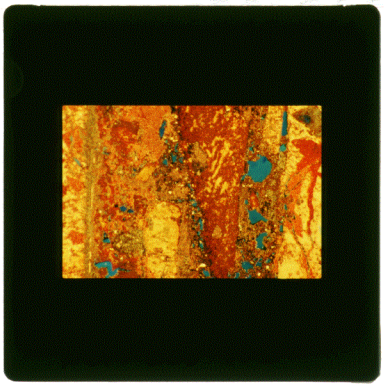
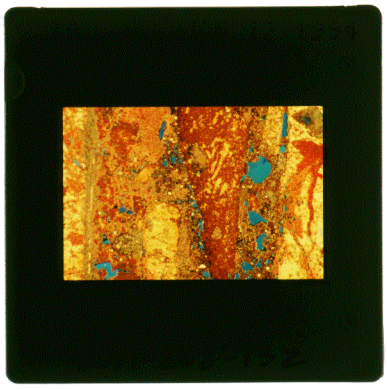
Date: 1/11/94

Microscope: Nikon

Camera: Nikon

Film: 100 color slide

Photo No.	Sample No. and description	Obj.	FOV	Light
1	NOPI-268-TS1	1X		
2	"			
3	NOPI-268-TS1	1X		
4	"			
5	NOPI-268-TS1	2X		
6				
7	NOPI-268-TS1	2X		
8				
9	NOPI-268-TS1	4X		
10				
11	NOPI-268-TS2	1X		
12				
13	NOPI-268-TS2	1X		
14				
15	NOPI-268-TS2	2X		
16				
17	NOPI-268-TS2	2X		
18				

PHOTOGRAPHY

Photographer: JP

Microscope:

Type of photography:

Camera:

Date:

Film:

Photo No.	Sample No. and description	Obj.	FOV	Light
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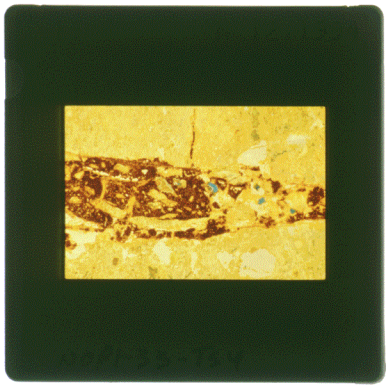
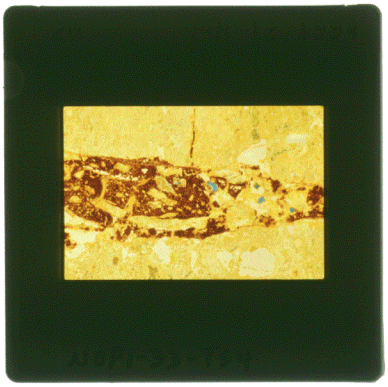
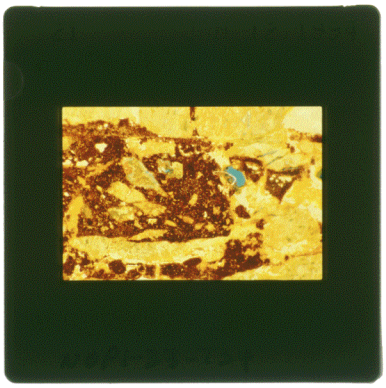
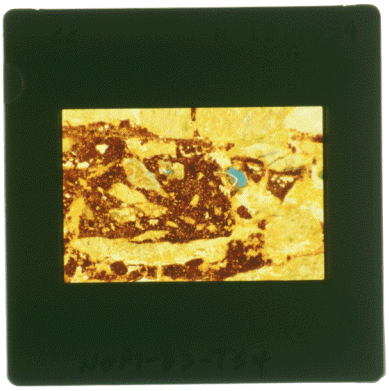
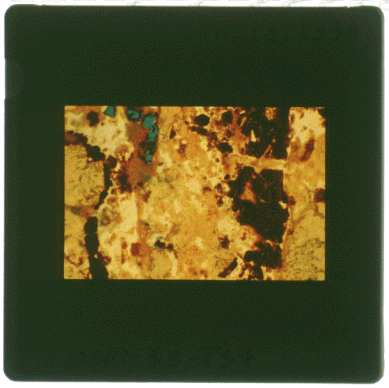
20				
21	NOP1-33-TS4	2X		
22				
23	NOP1-33-TS4	4X		
24				

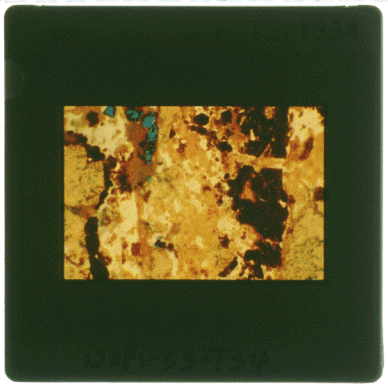












PHOTOGRAPHY

Photographer: JP

Type of photography: Petrographic

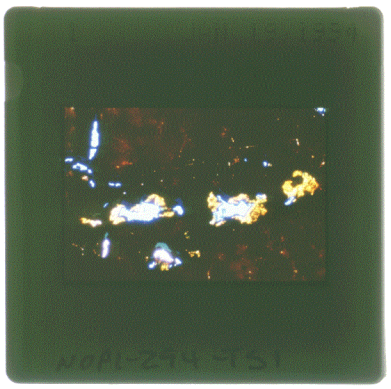
Date: 1/17/94

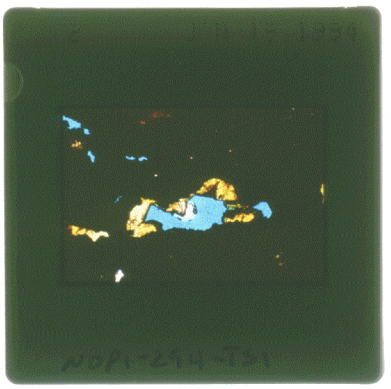
Microscope: Nikon

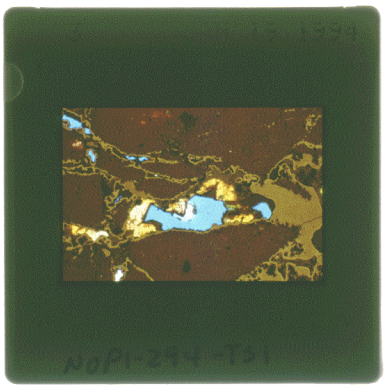
Camera: Nikon

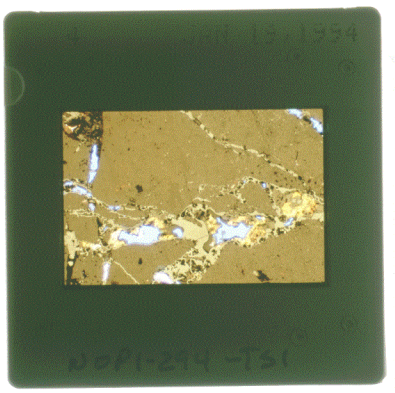
Film: Eckachrome 200 slide

	Photo No.	Sample No. and description		Obj.	FOV	Light
	1	NOPI-294-TS1	Wulfenite? crystals in Fe oxide bearing fractures in hematized tuff	5X		PL
	2		Same as #1	10X		PL
	3		Same as #2	10X		PL/RL
	4		Same as #1	5X		PL/RL
1	5		Fe-oxides filling fracture - crystalline & amorphous, wulfenite in some fractures	5X		RL
	6		Same as #5	10X		RL
	7		Same as #5	20X		RL
2	8		Fe-oxides in fracture crystalline + amorphous	5X		RL
	9		Same as #8	10X		RL
	10		Same as #8	20X		RL
3	11		Fe oxide bearing fracture	5X		RL
	12		Same as #11	10X		RL
	13		Same as #1	20X		RL


NOPI-294-TS1


NOPI-294-TS1


NOPI-294-TS1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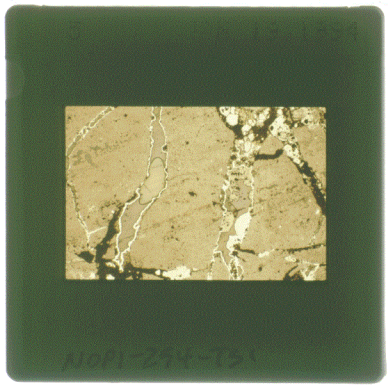
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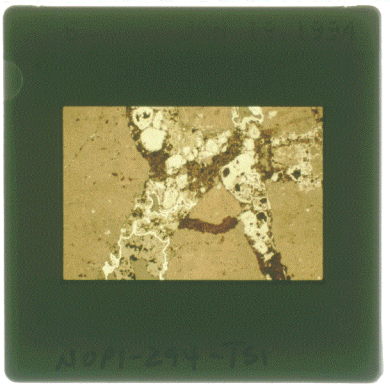
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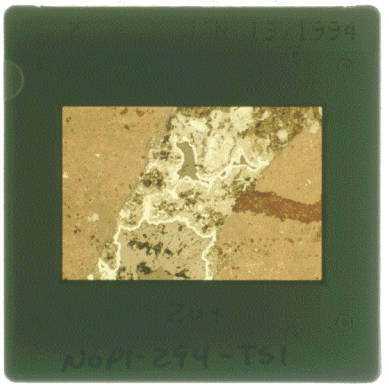
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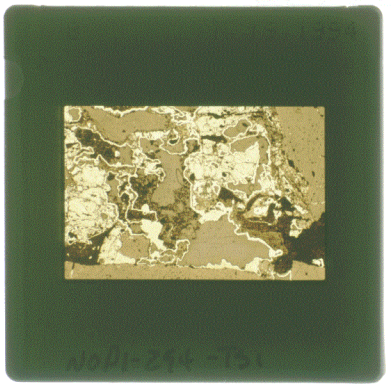
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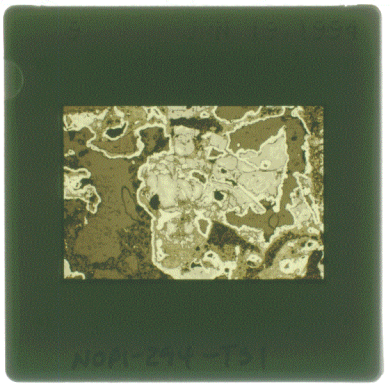
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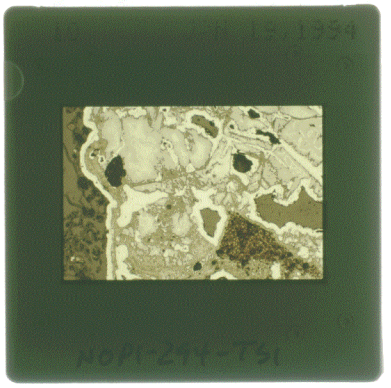
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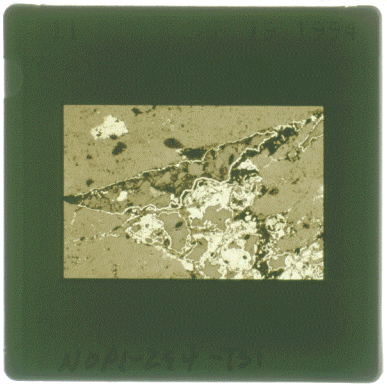
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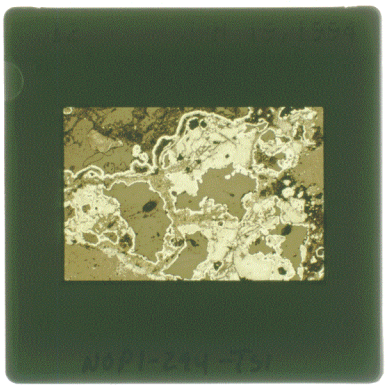
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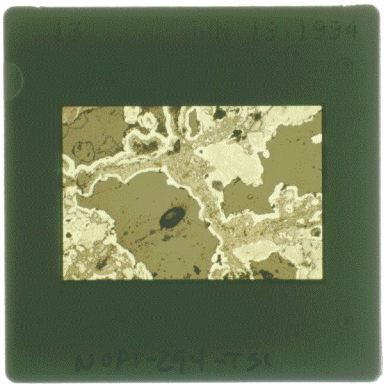

NOPI-294-TS1

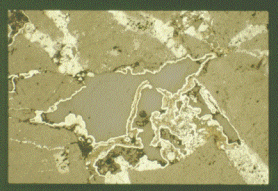
PHOTOGRAPHY

Photographer: Microscope:

Type of photography: Camera:

Date: Film:

	Photo No.	Sample No. and description	Obj.	FOV	Light
4	14	Fe-oxide being porous fracture	5x		RL
	15	Same as 14	10x		RL
	16	Same as 14	20x		RL
5	17	Large Fe-oxide being fracture	5x		RL
	18	Same as 17	10x		RL
	19	Same as 17	20x		
	20	Shows Fe-oxides filling fracture with no visible porosity	5x		RL
	21	Shows variation in color of phases filling fracture	10x		RL
	22	Same as 21	20X		RL
	23	Wulfenite crystals growing from Fe oxide substrate	20X		RL/PL
	24	Same as #23	10X		XN/RL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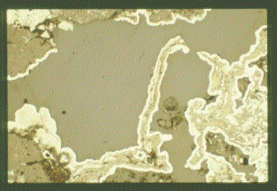
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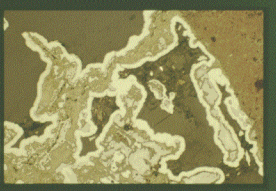
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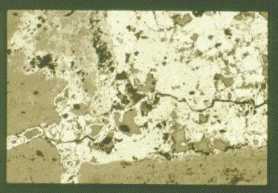
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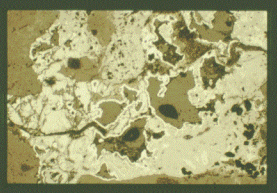
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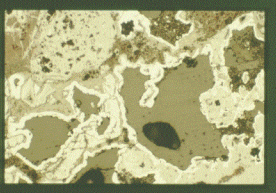
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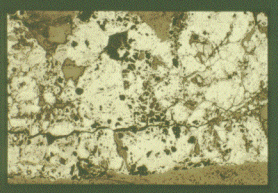
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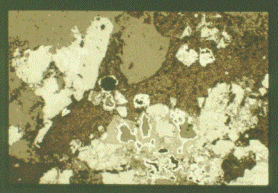
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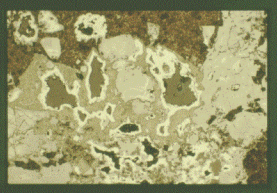
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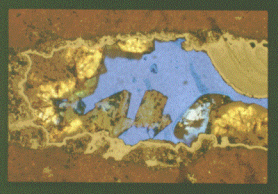
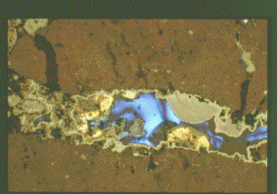



NOPI-294-TS1

PHOTOGRAPHY

Photographer: JP

Type of photography: TS

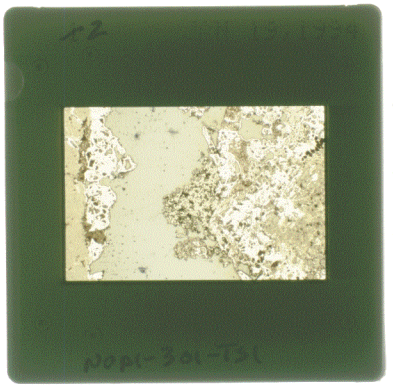
Date: 1/18/94

Microscope: Nikon

Camera: Nikon

Film: Elite 200 color slide

	Photo No.	Sample No. and description	Obj.	FOV	Light
1	1	NOPI-301-TS1 Fe oxides filling fracture between breccia fragments Jarosite, Fe-oxides.	5X		XN
	2	Same as #1	5X		RL
	3	Same as #1	10X		RL
	4	Same as #1	20X		RL
2	5	Fe oxides + jarosite in fracture cement host rock fragments	5X		XN
	6	Same as #5	5X		RL
	7	Same as #5	10X		XN
	8	Same as #5	10X		RL
	9	Same as #5	20X		RL
3	10	Fe-oxide, jarosite in porous fracture cement rock frags.	5X		XN
	11	Same as 10	5X		RL
	12	Same as 10	10X		XN
	13	Same as 10	10X		RL
	14	Same as 10	20X		RL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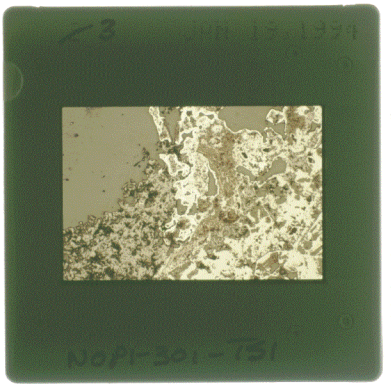
NOPI-301-T31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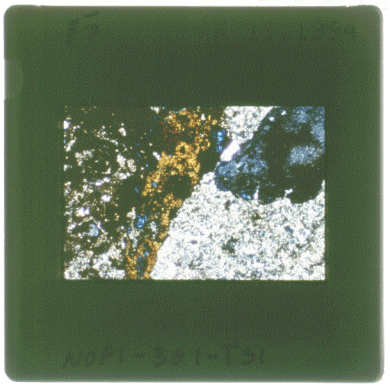
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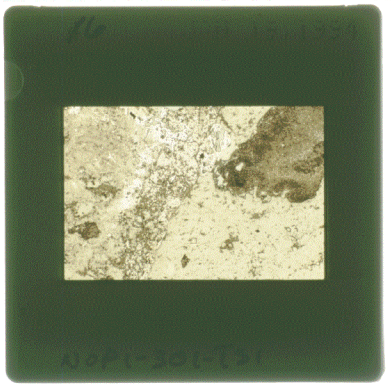
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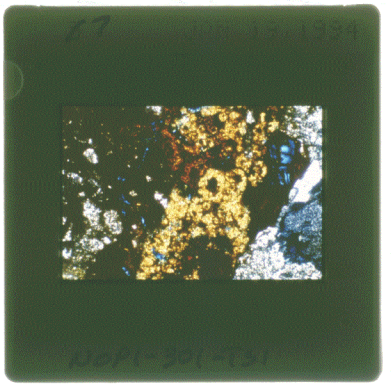
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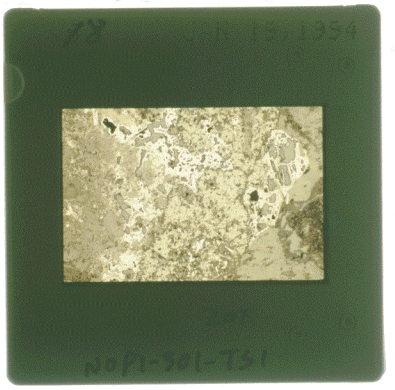
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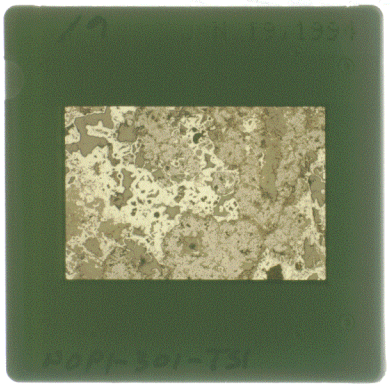
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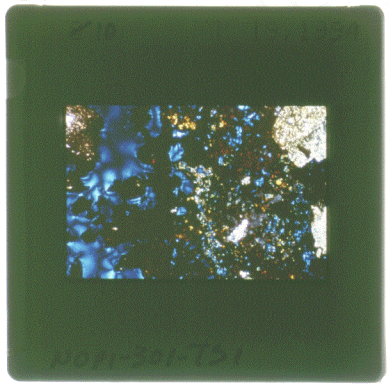
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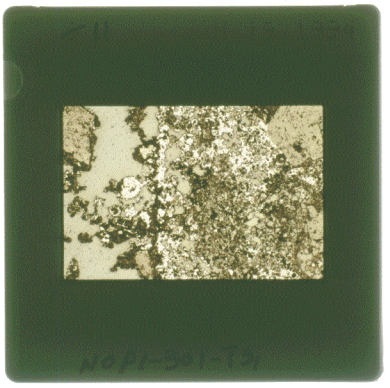
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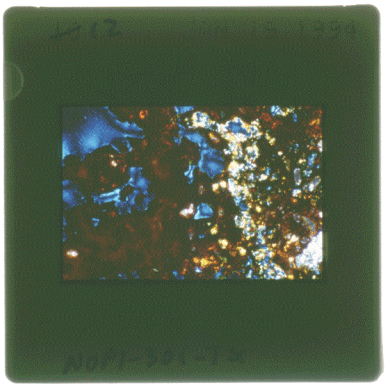
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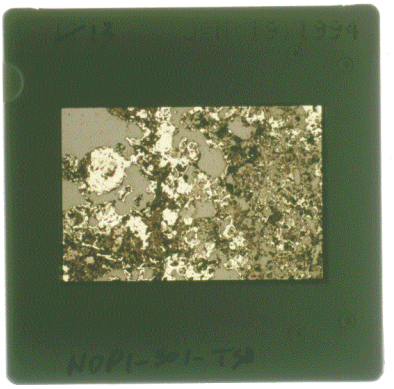
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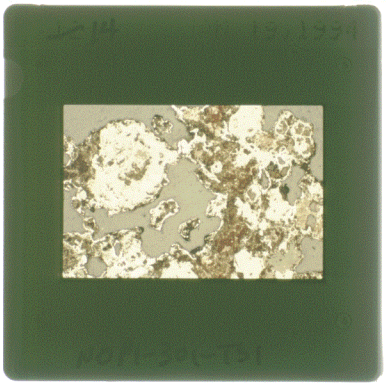
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NOPI-301-T31

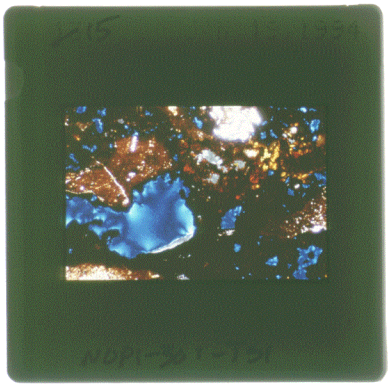
PHOTOGRAPHY

Photographer: Microscope:

Type of photography: Camera:

Date: Film:

	Photo No.	Sample No. and description	Obj.	FOV	Light
4	15	Fe-oxide, jarosite, amorphous material in fracture cement rock frag.	5x		XN
	16	Same as 15	5x		RL
	17	Same as 15	10x		RL
	18	Same as 15	20x		RL
5	19	Fe-oxide, jarosite, replaced pyrite in fracture	5x		XN
	20	Same as 19	5x		RL
	21	Same as 19	10x		RL
	22	Same as 19	10x		RL
	23	Same as 19	20x		RL
	24	Same as 19	20x		RL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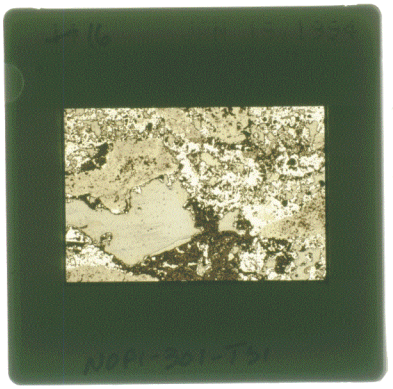
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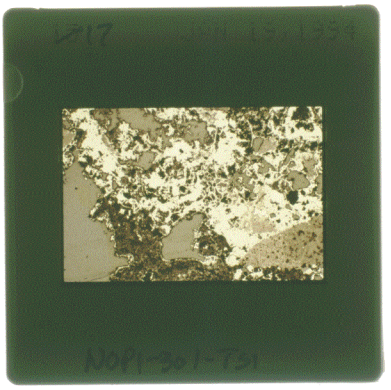
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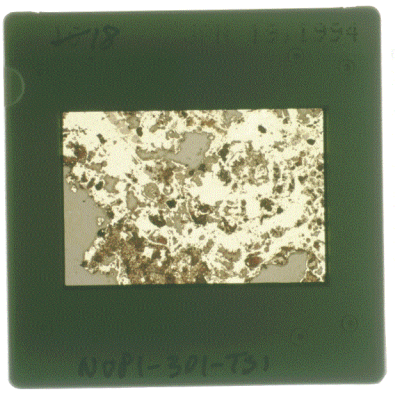
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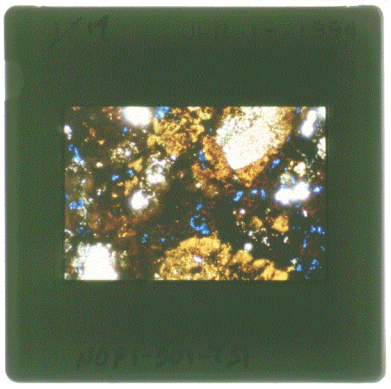
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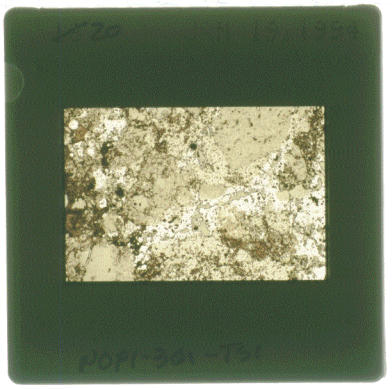
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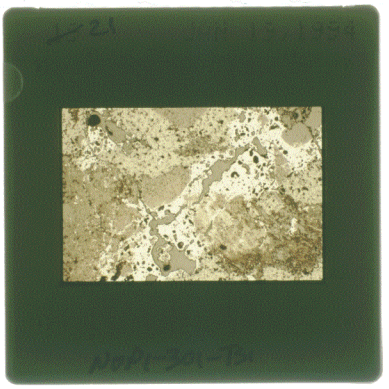
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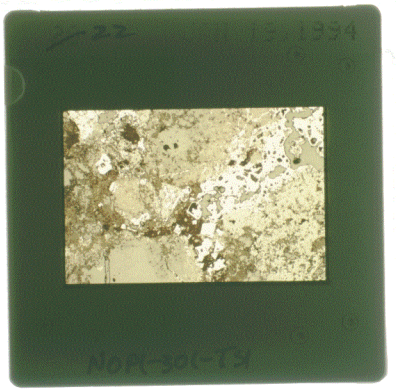
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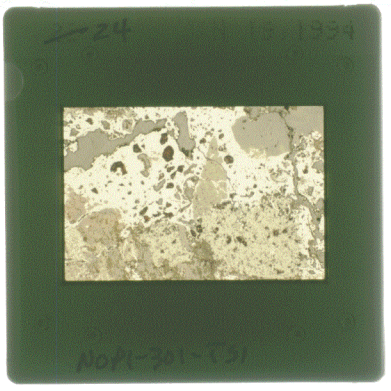
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