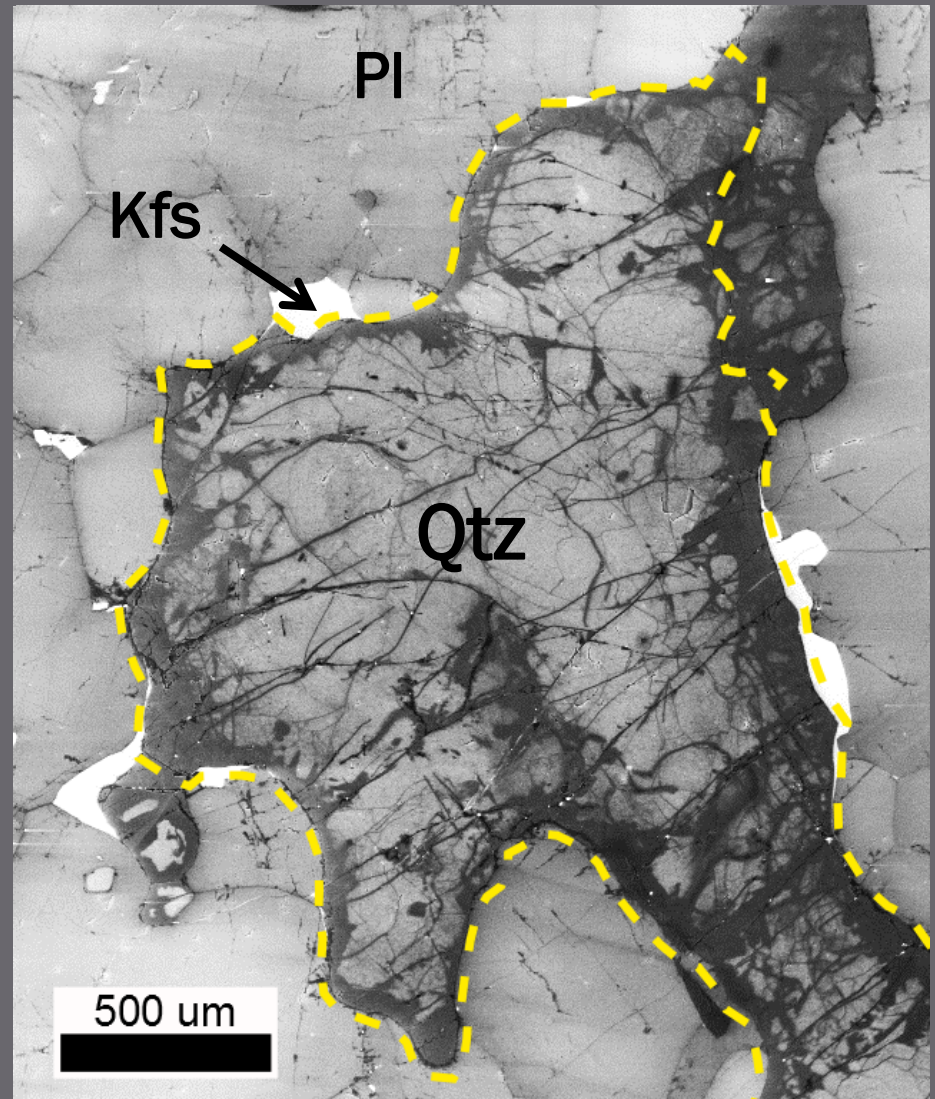


Cathodoluminescence
imaging
of high-grade
microstructures
in quartz,
Central Gneiss belt,
Ontario, Canada



Stephanie Mills, Chris Gerbi, Scott Johnson
University of Maine
School of Earth & Climate Sciences

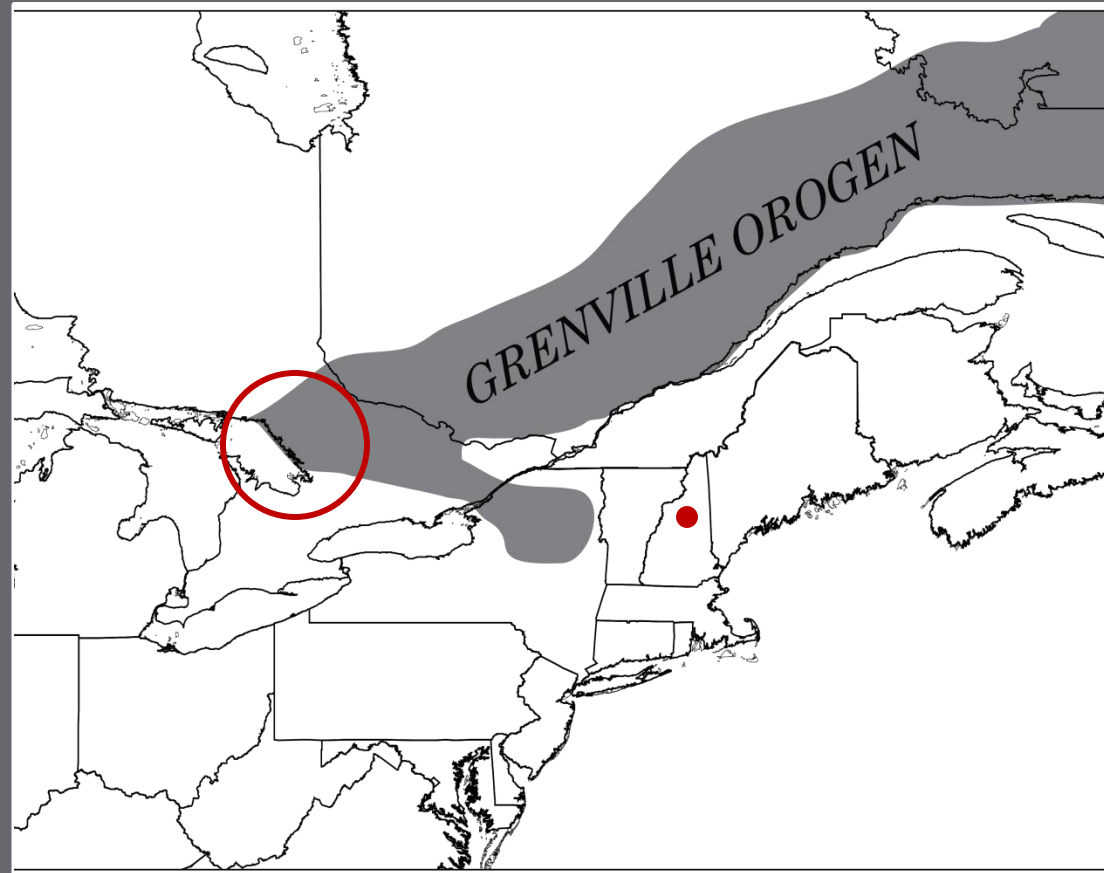


SEM-CL image

Bright quartz with dark microstructures

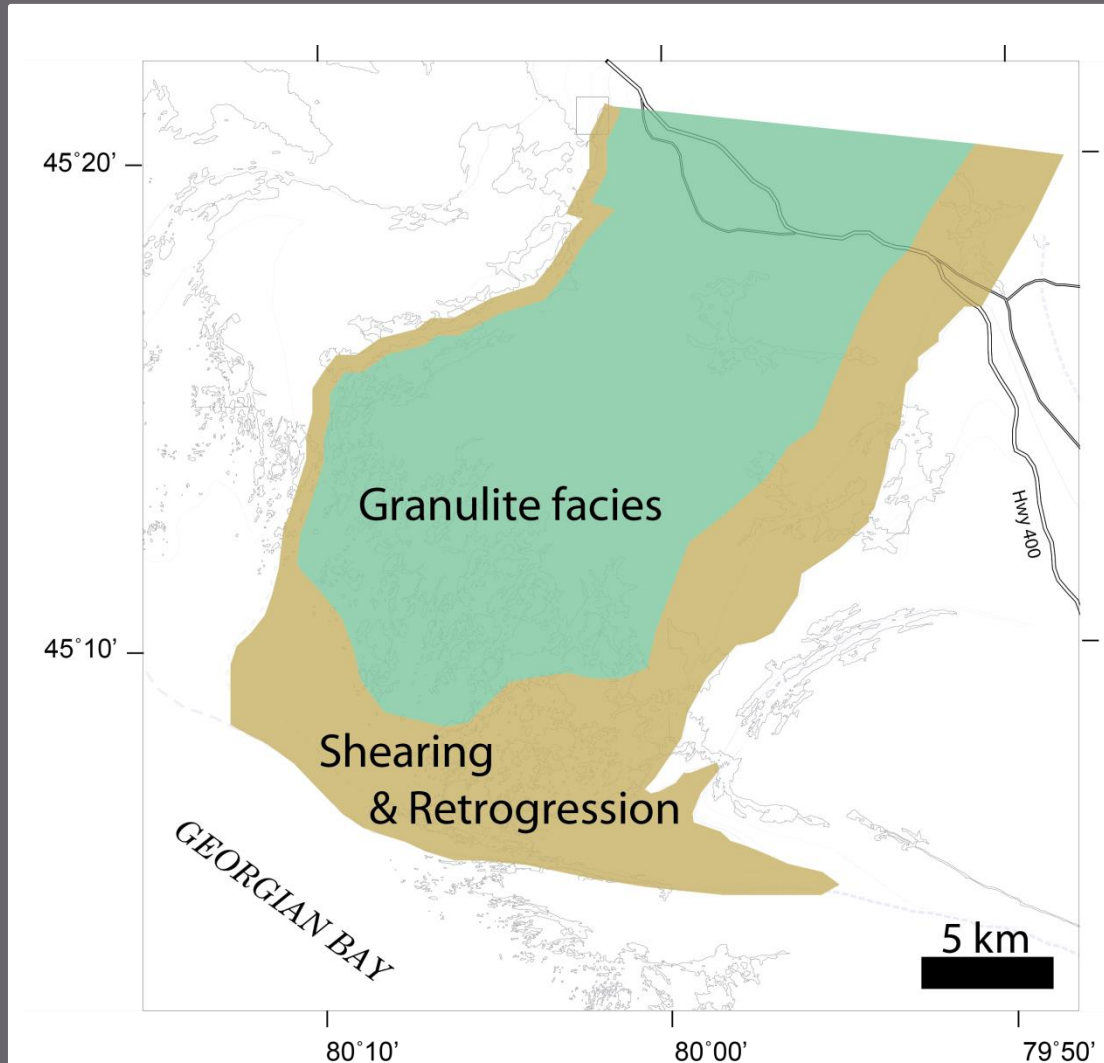
Field Area: Parry Sound Domain

Deformation &
retrogression during
transport over
Laurentian craton from
~1.16-1.1 Ga



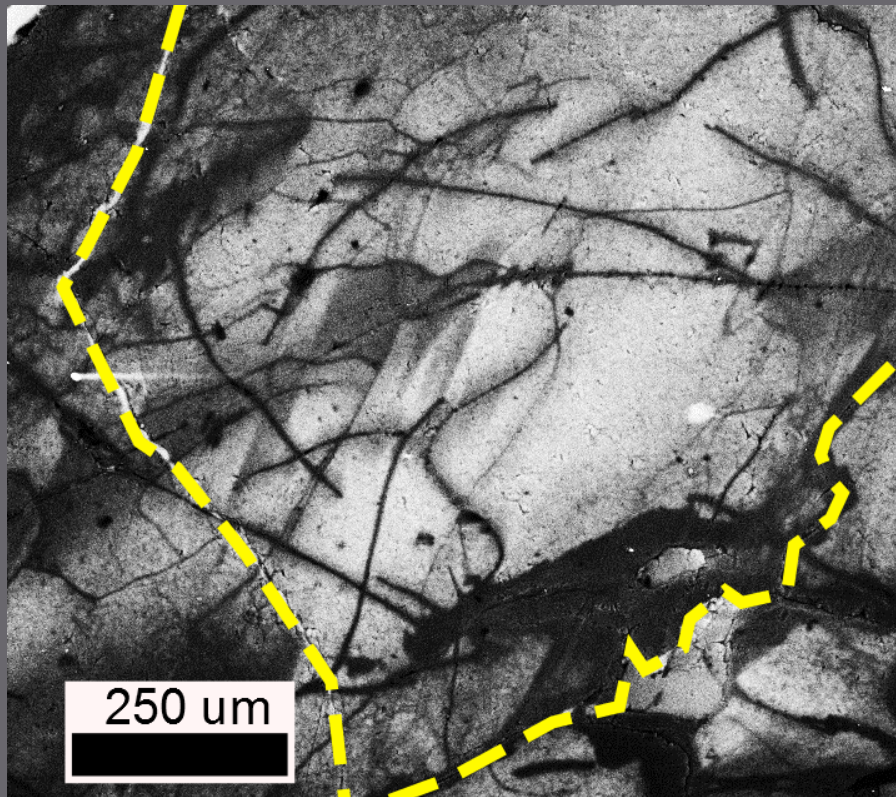
Field Area: Parry Sound Domain

Deformation &
retrogression during
transport over
Laurentian craton from
~1.16-1.1 Ga

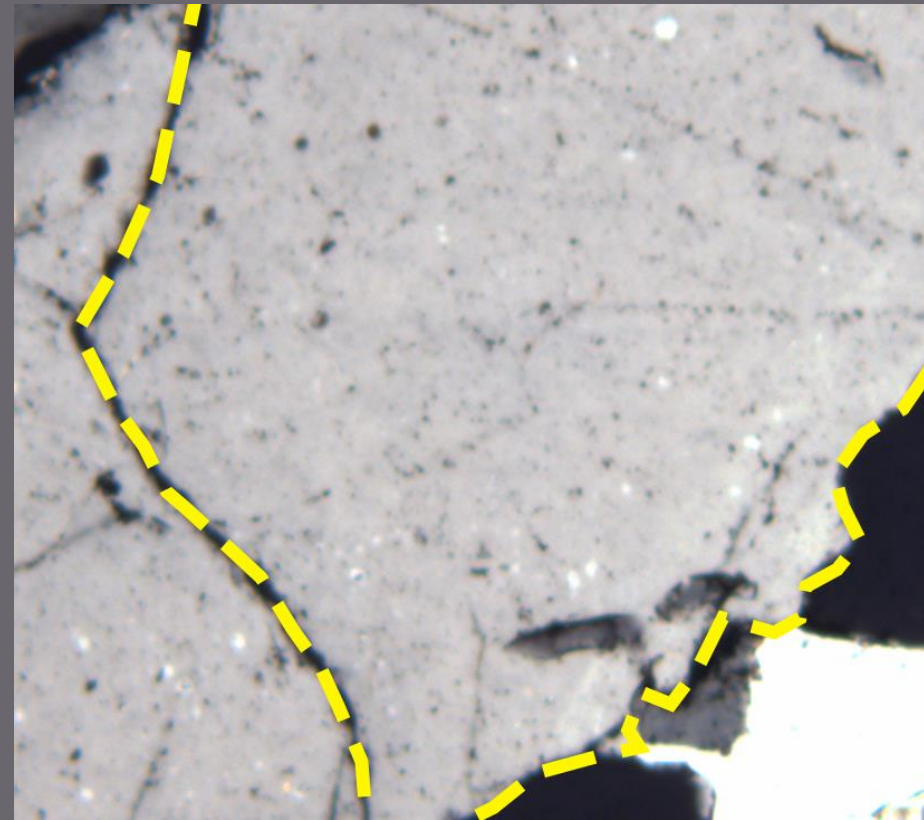


CL Reveals Microstructures

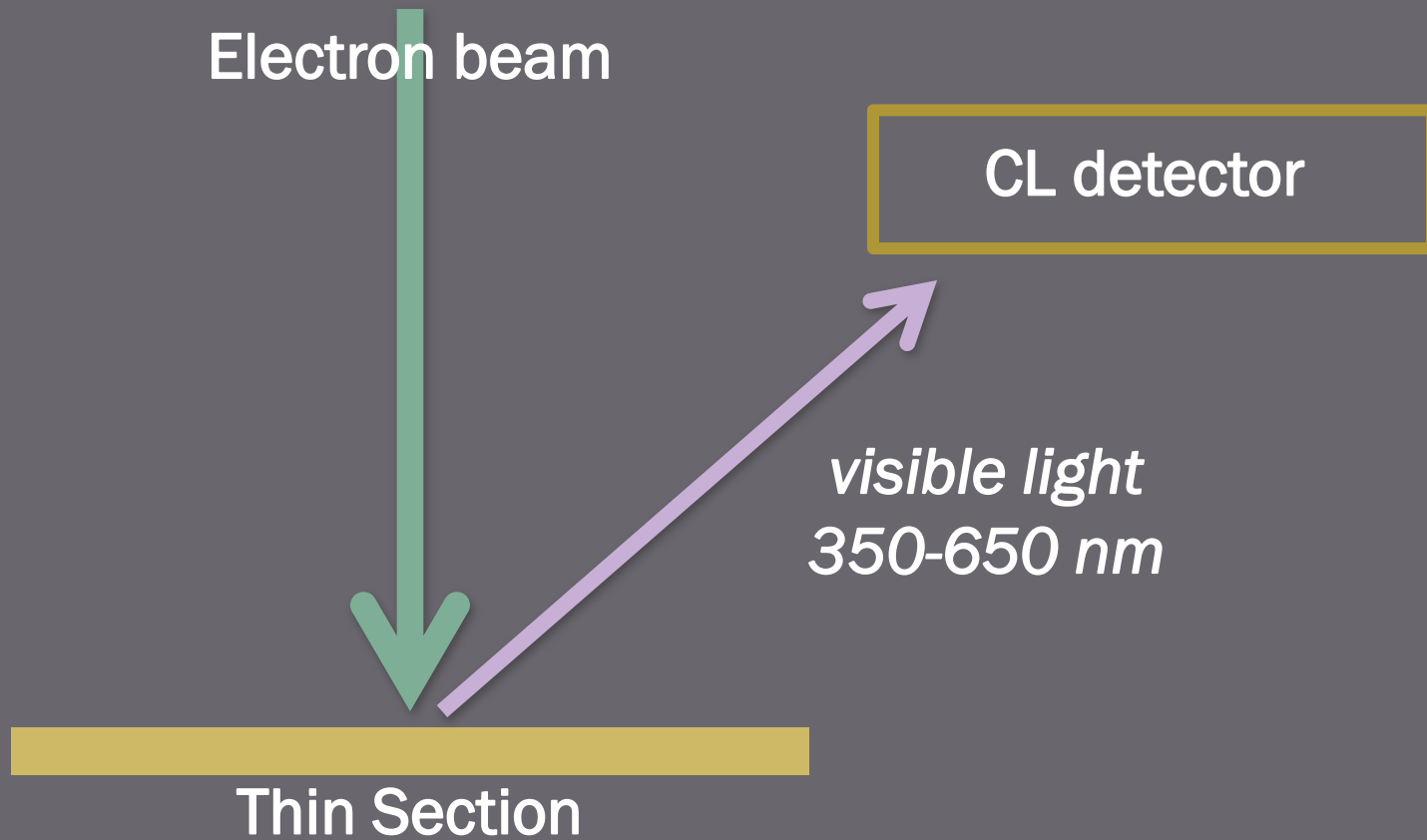
CL



Optical



How CL Works

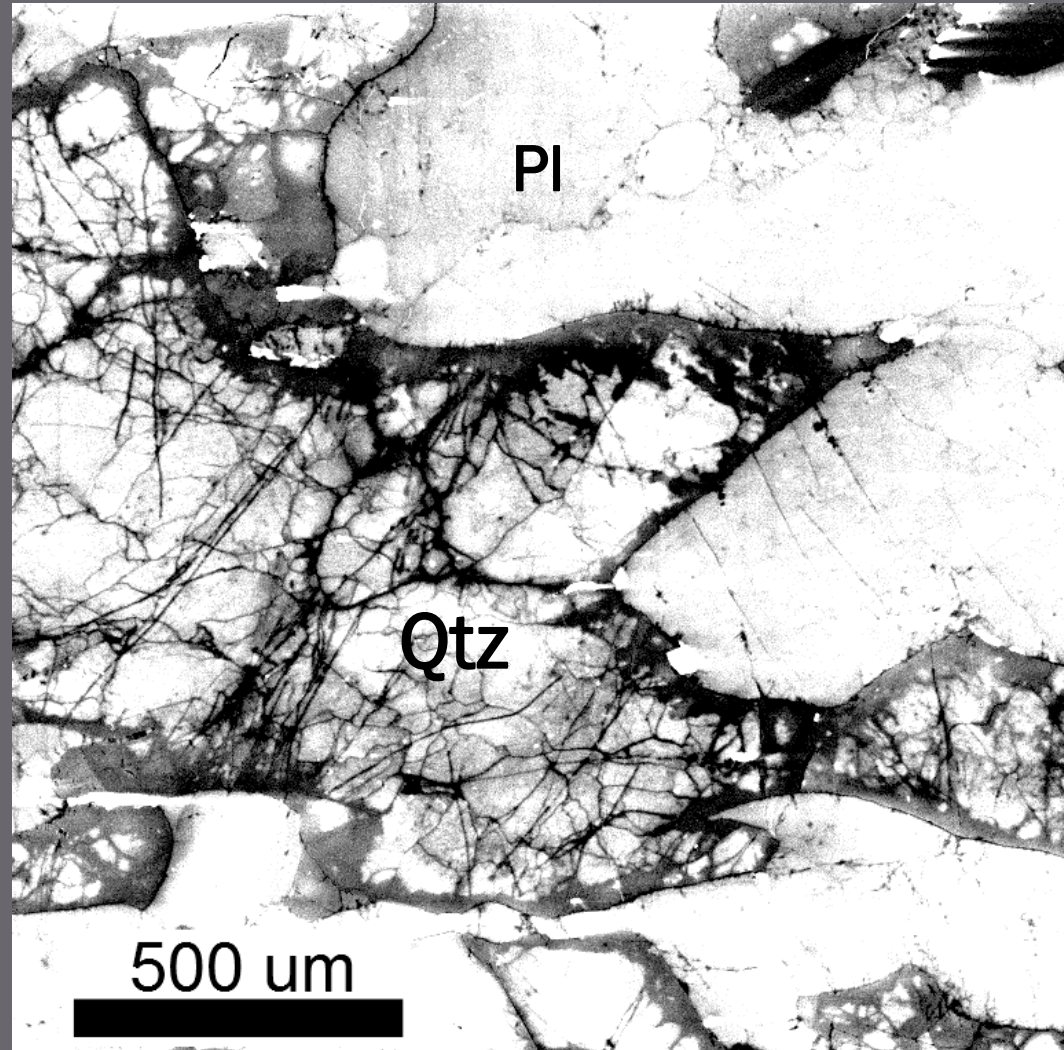


Cause of CL Signal

☞ Activators

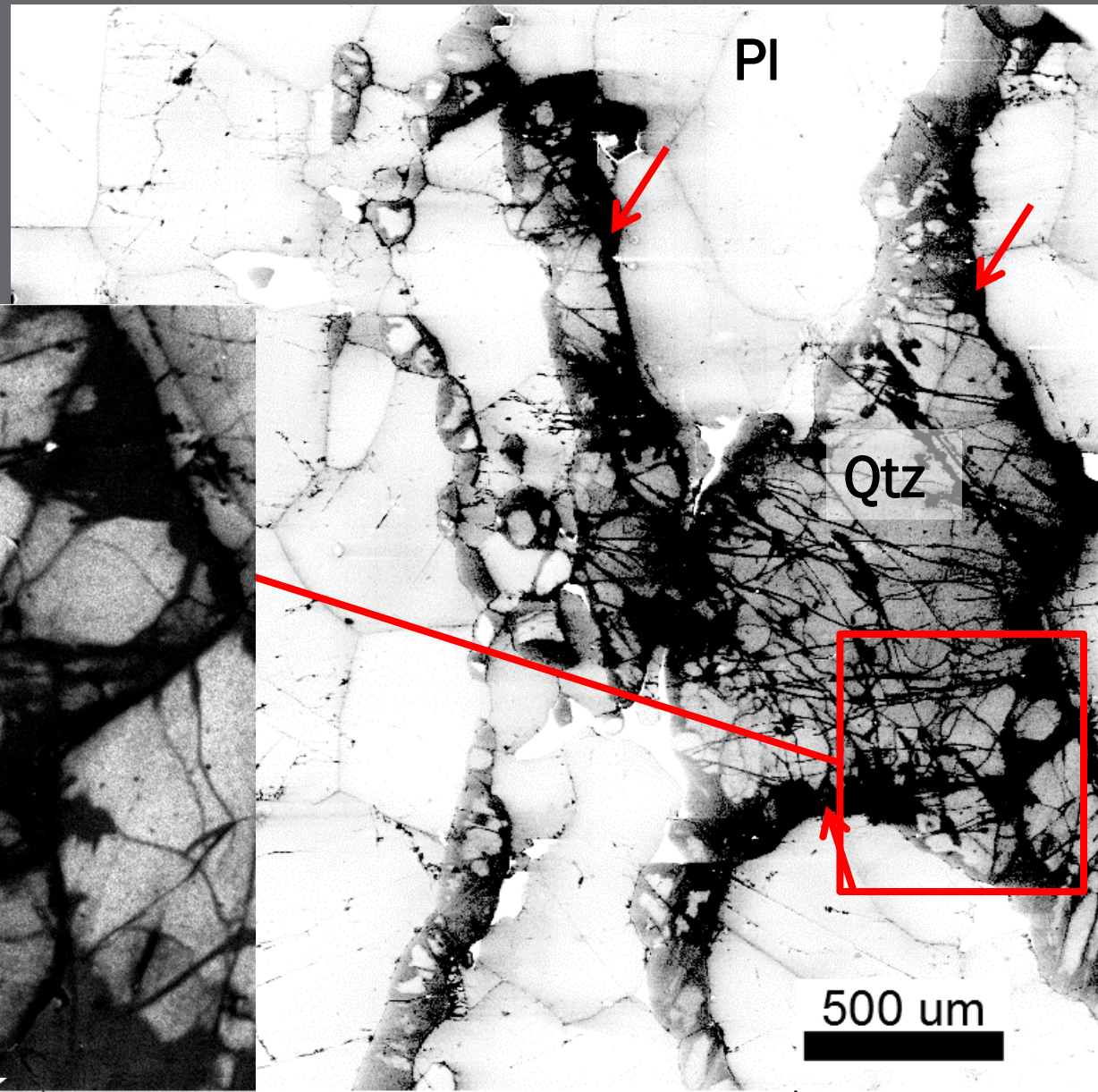
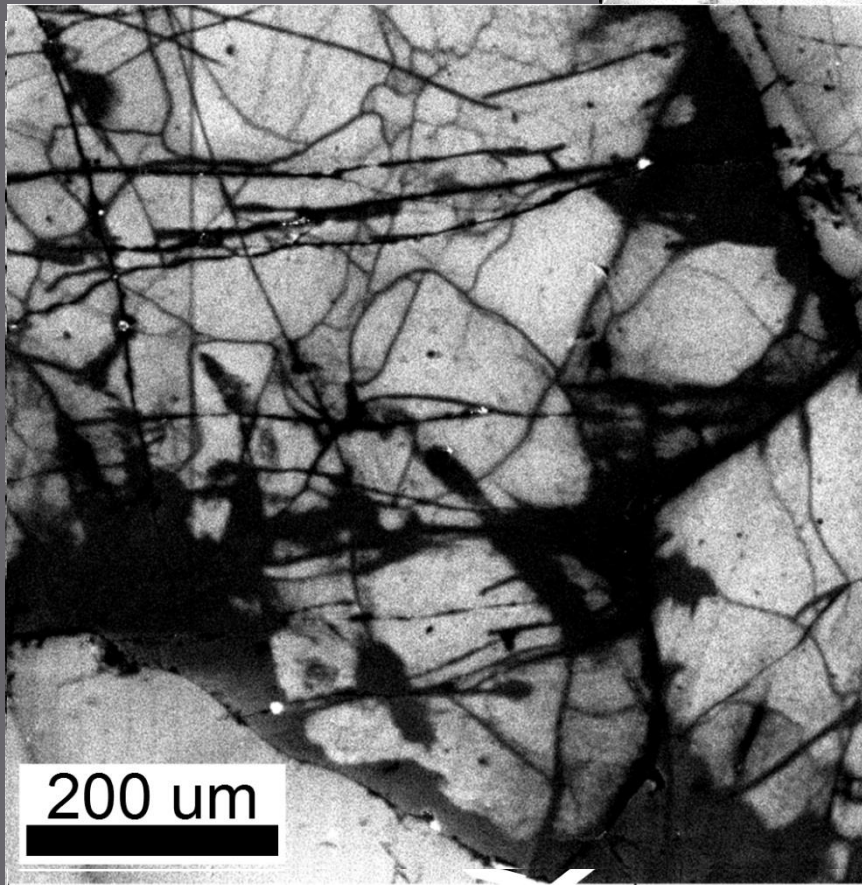
- Vacancies
- Trace elements
 - Ti, Al, Fe

☞ Intensity corresponds to concentration of activators



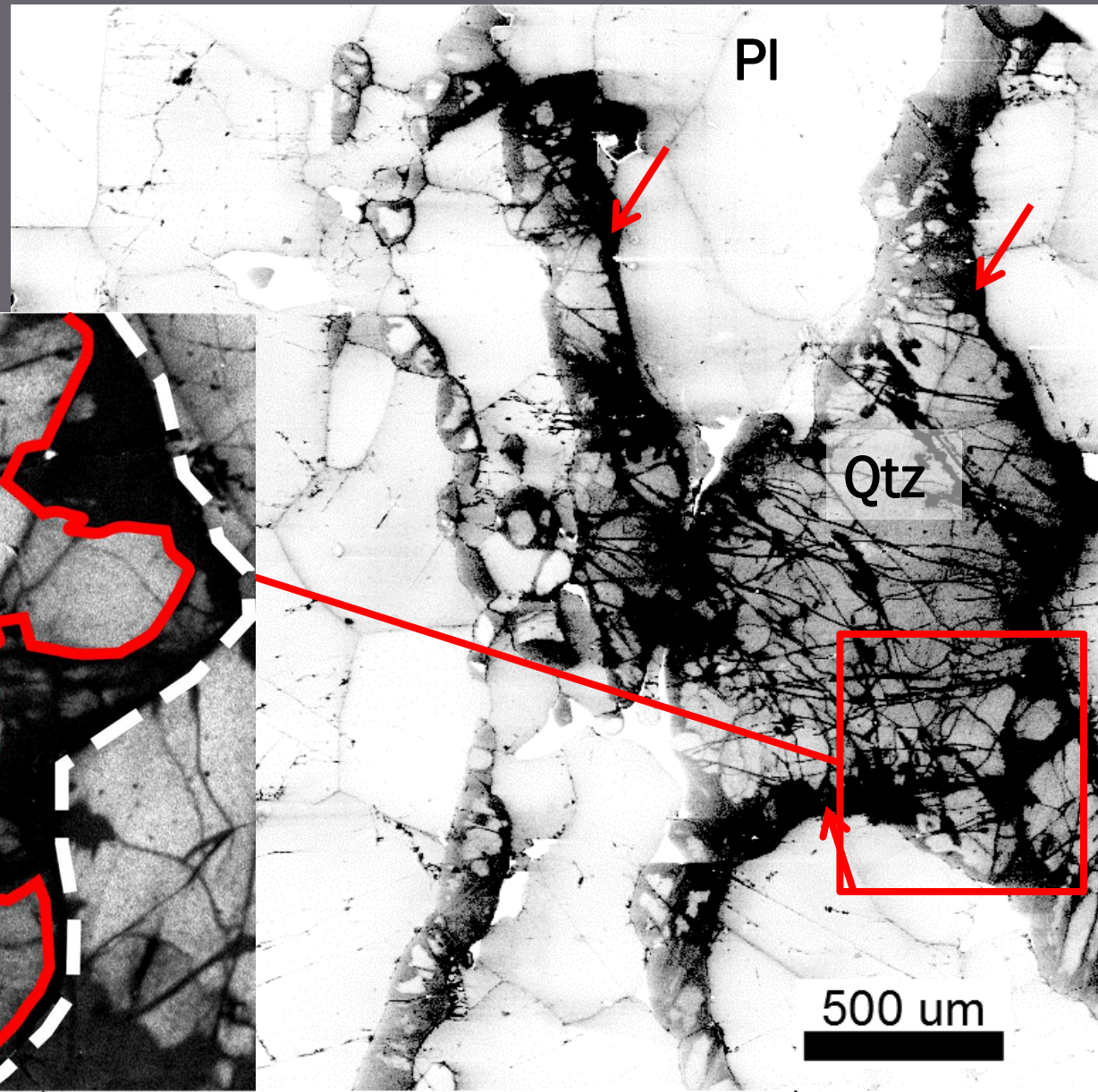
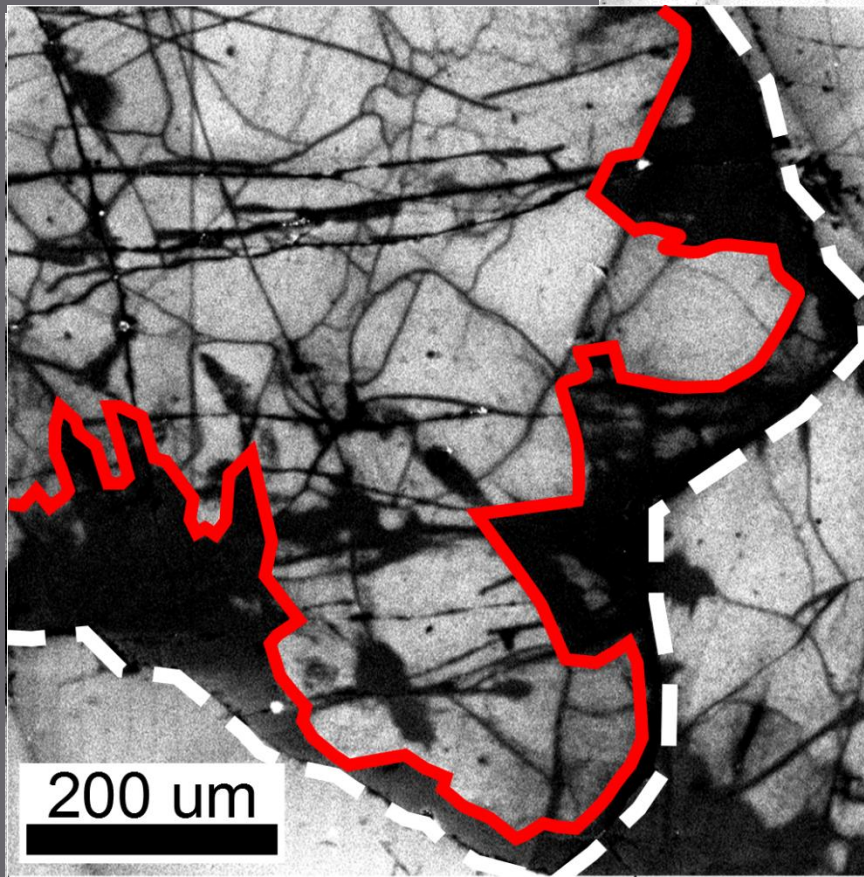
Microstructures

1. Mantle



Microstructures

1. Mantle

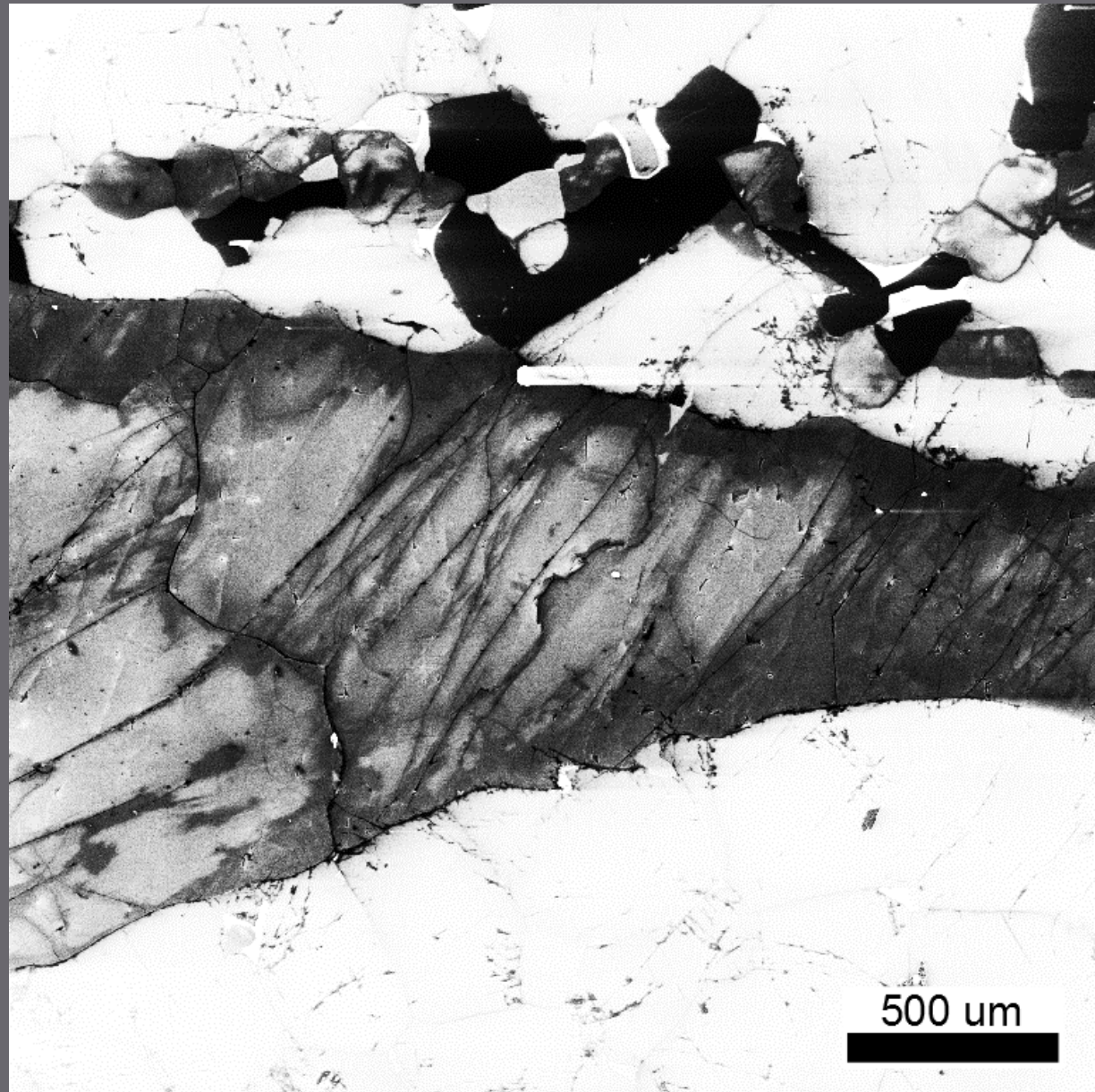


Microstructures

1. Mantle

2. Lines

a) Straight

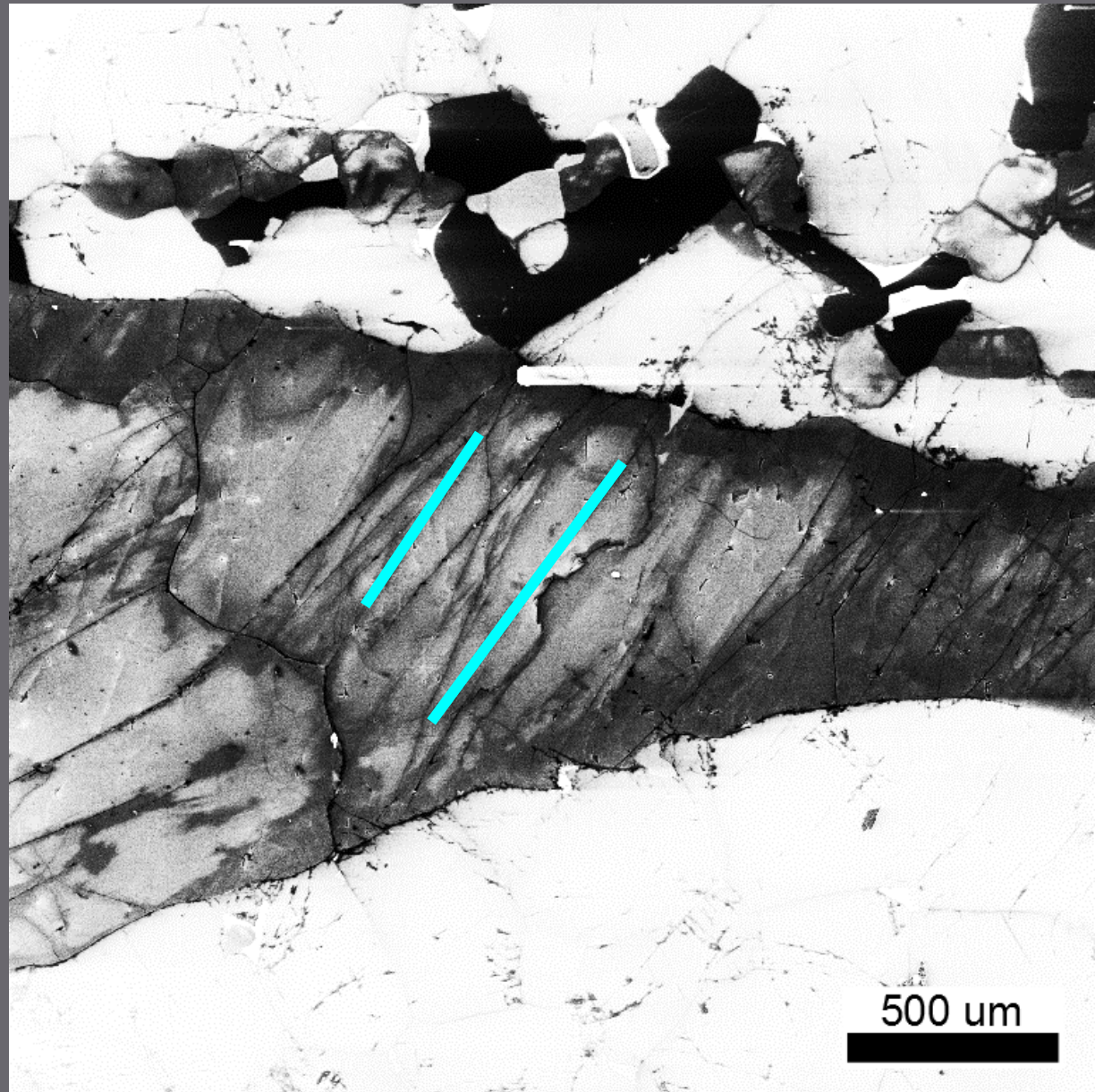


Microstructures

1. Mantle

2. Lines

a) Straight



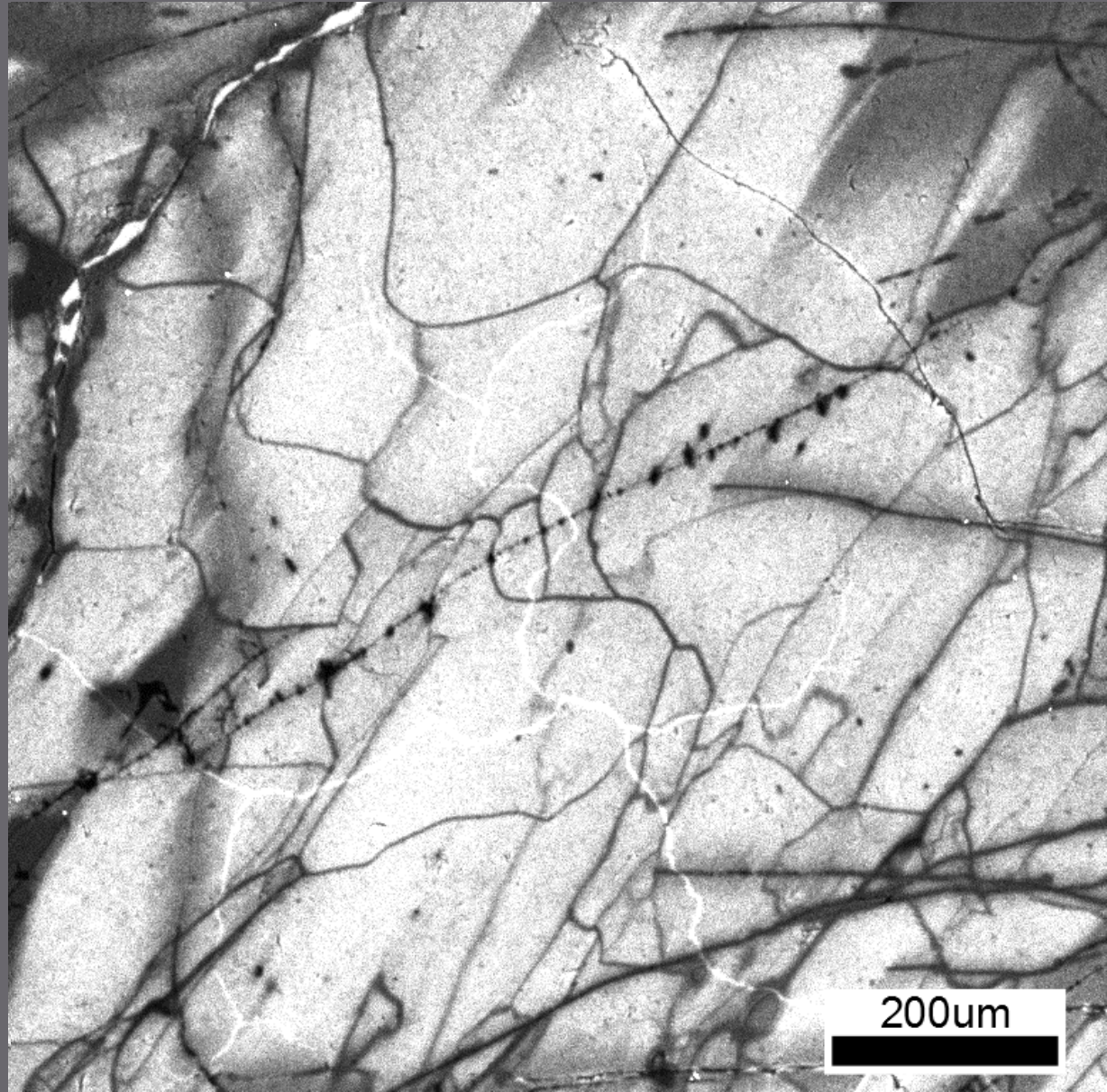
Microstructures

1. Dark mantle

2. Lines

a) Straight

b) Sinuous



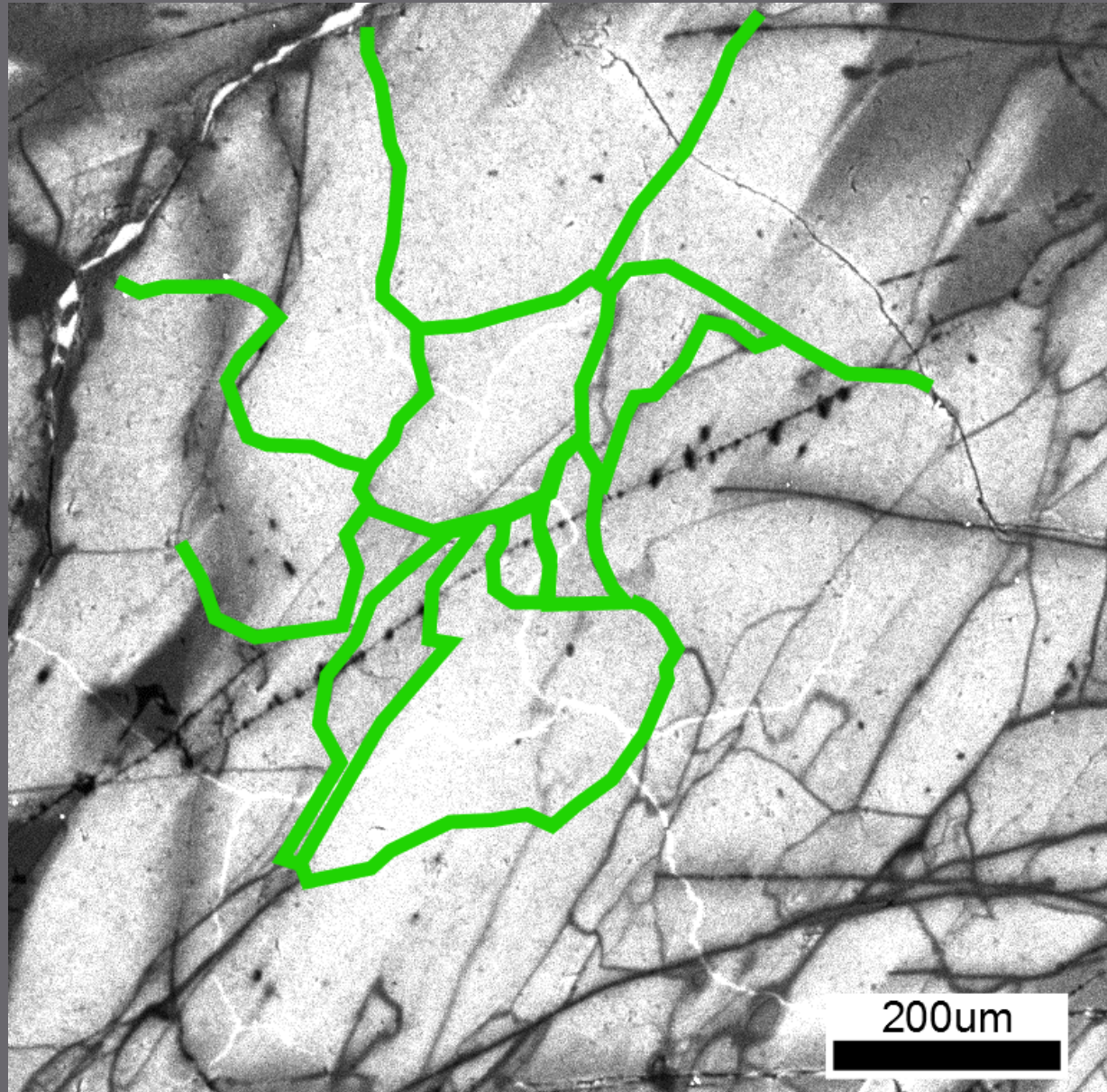
Microstructures

1. Dark mantle

2. Lines

a) Straight

b) Sinuous



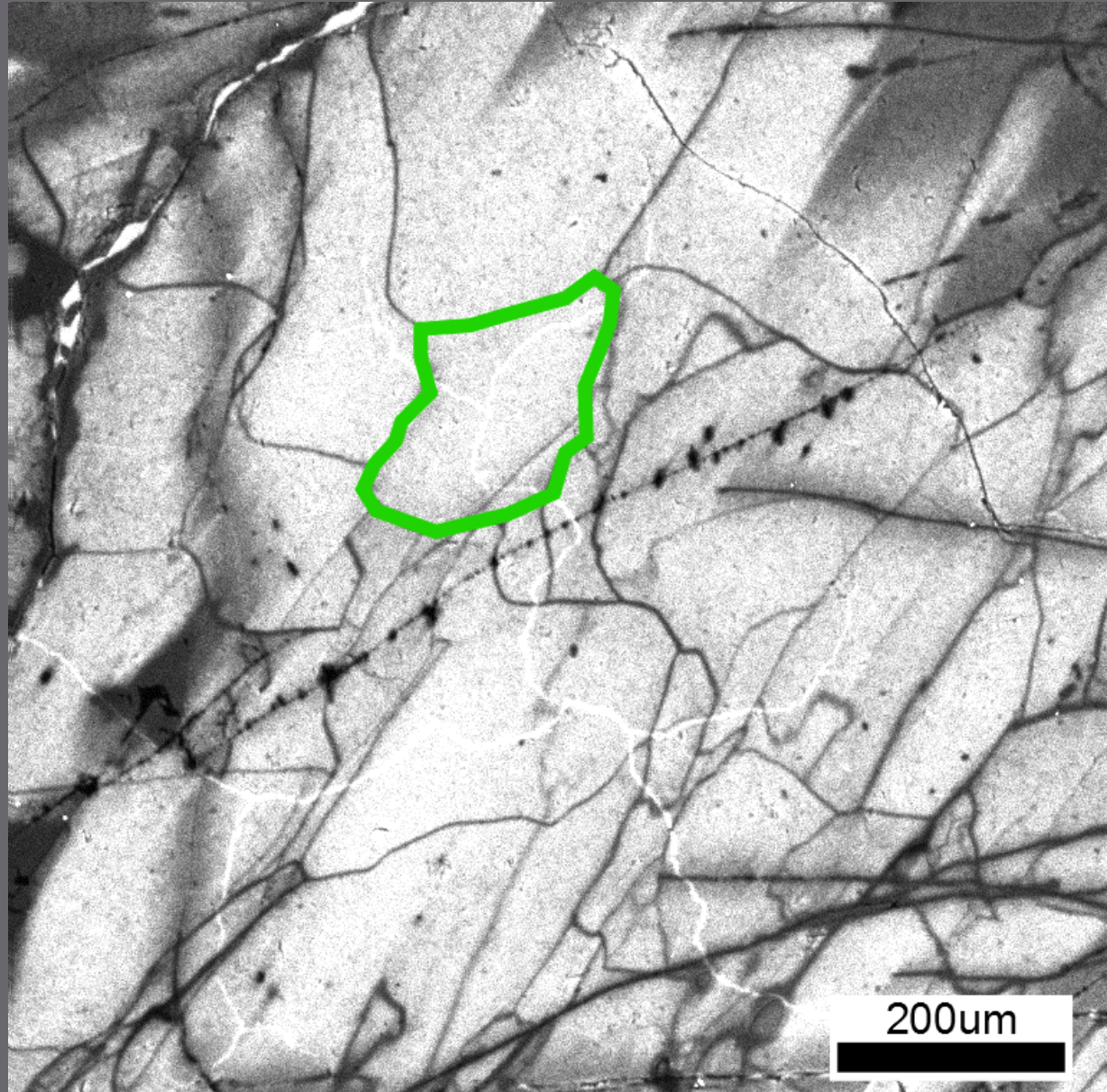
Microstructures

1. Dark mantle

2. Lines

a) Straight

b) Sinuous



Microstructures

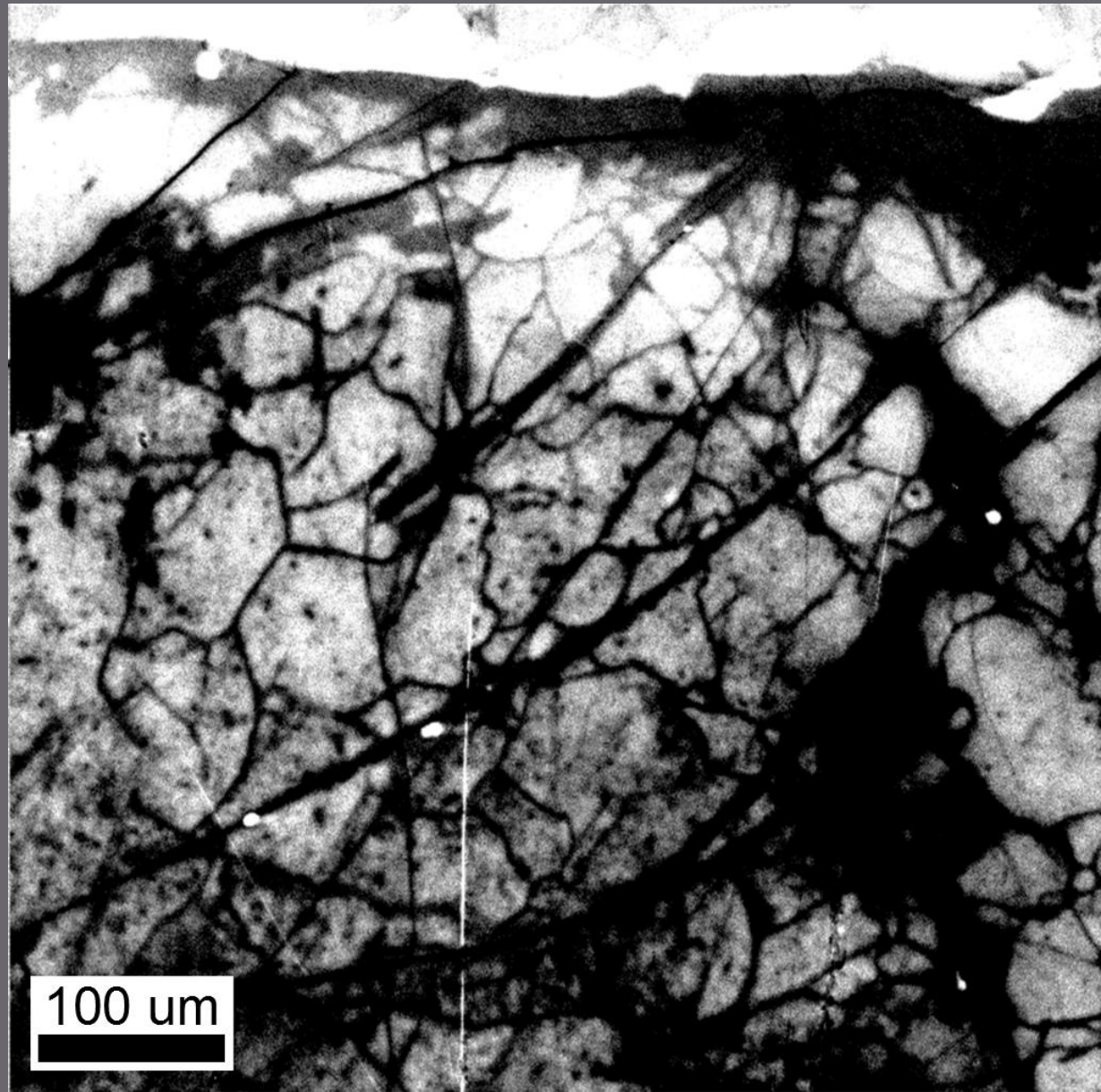
1. Dark mantle

2. Lines

a) Straight

b) Sinuous

Cross-cutting
Relationships



Microstructures

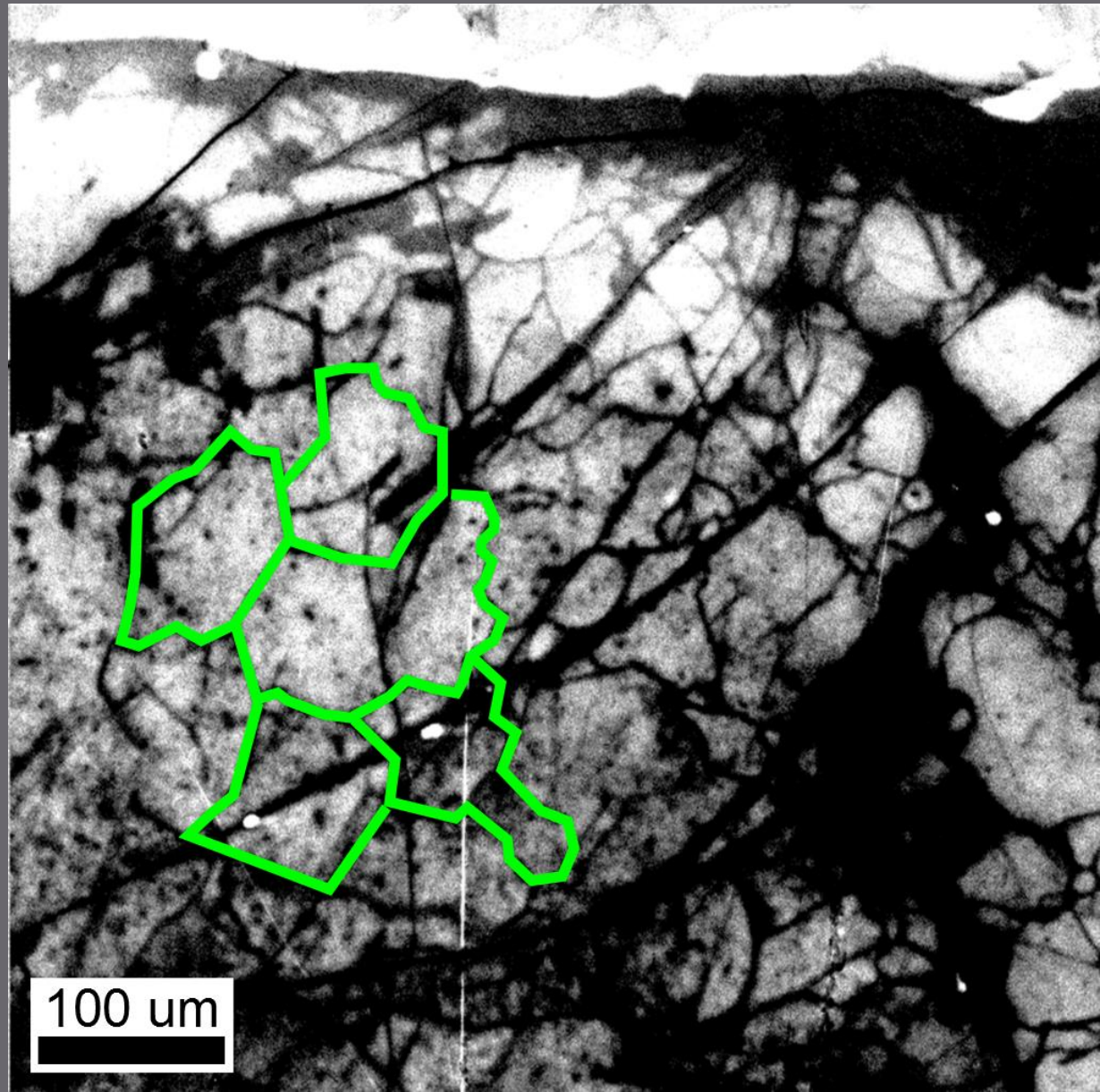
1. Dark mantle

2. Lines

a) Straight

b) Sinuous

Cross-cutting
Relationships



Microstructures

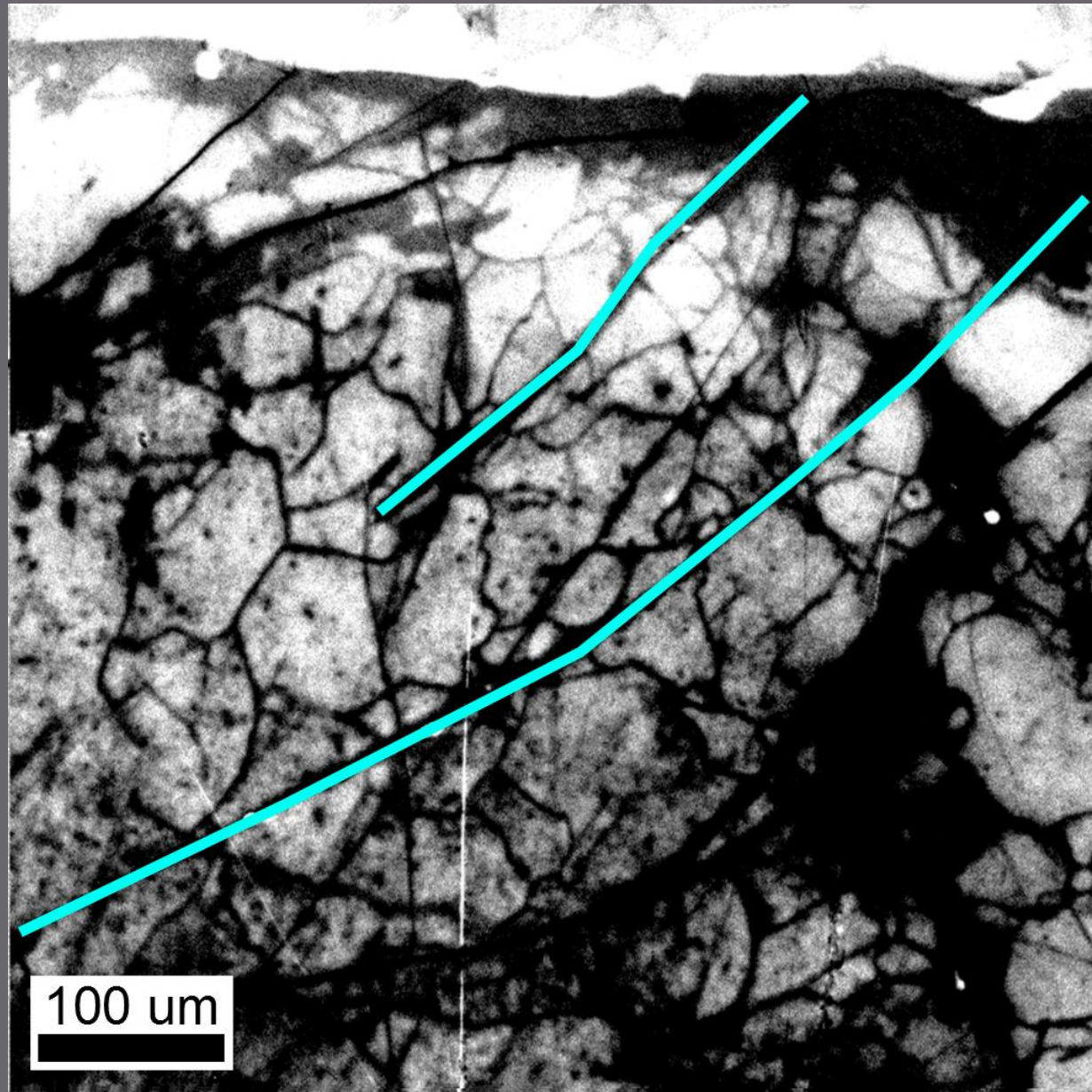
1. Dark mantle

2. Lines

a) Straight

b) Sinuous

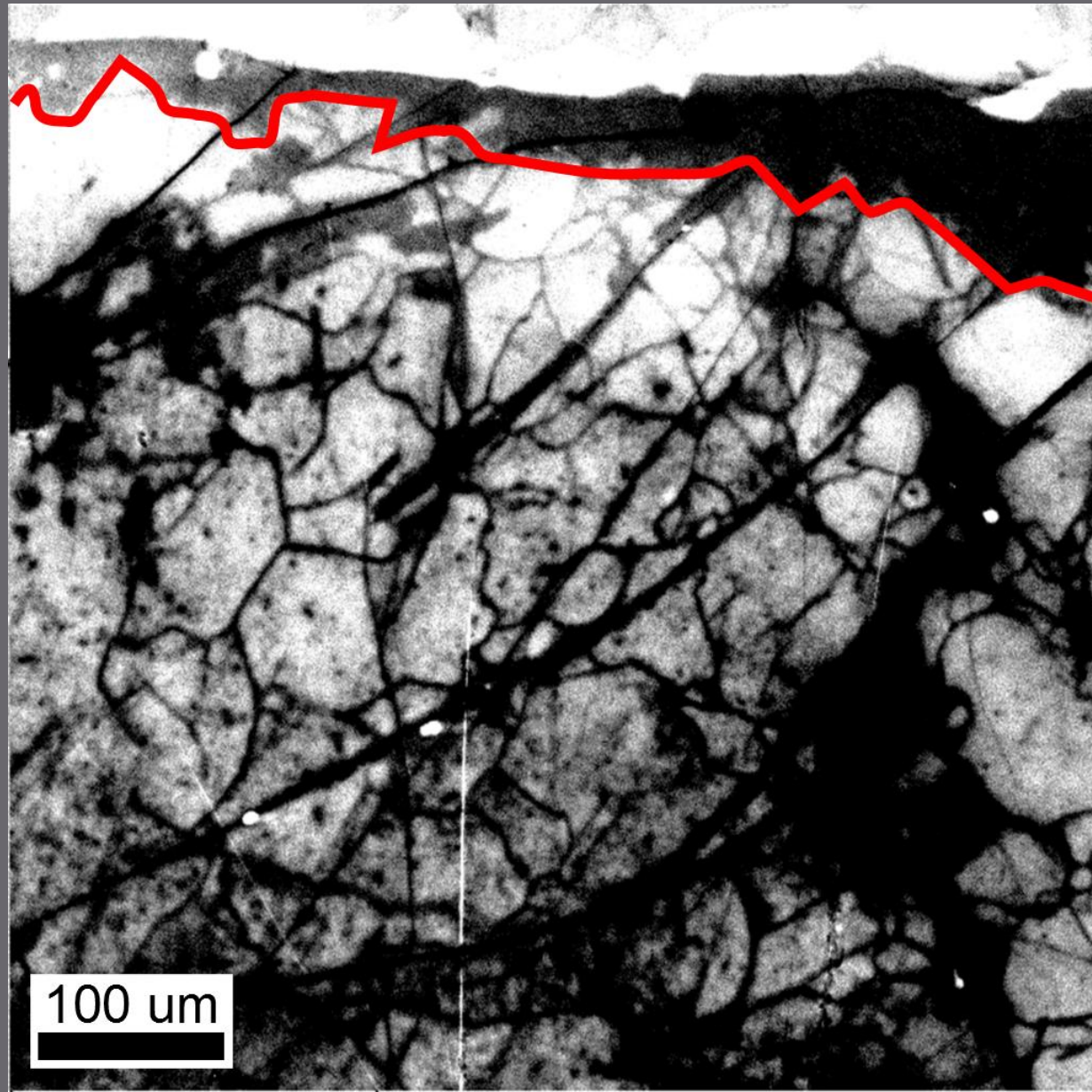
Cross-cutting
Relationships



Microstructures

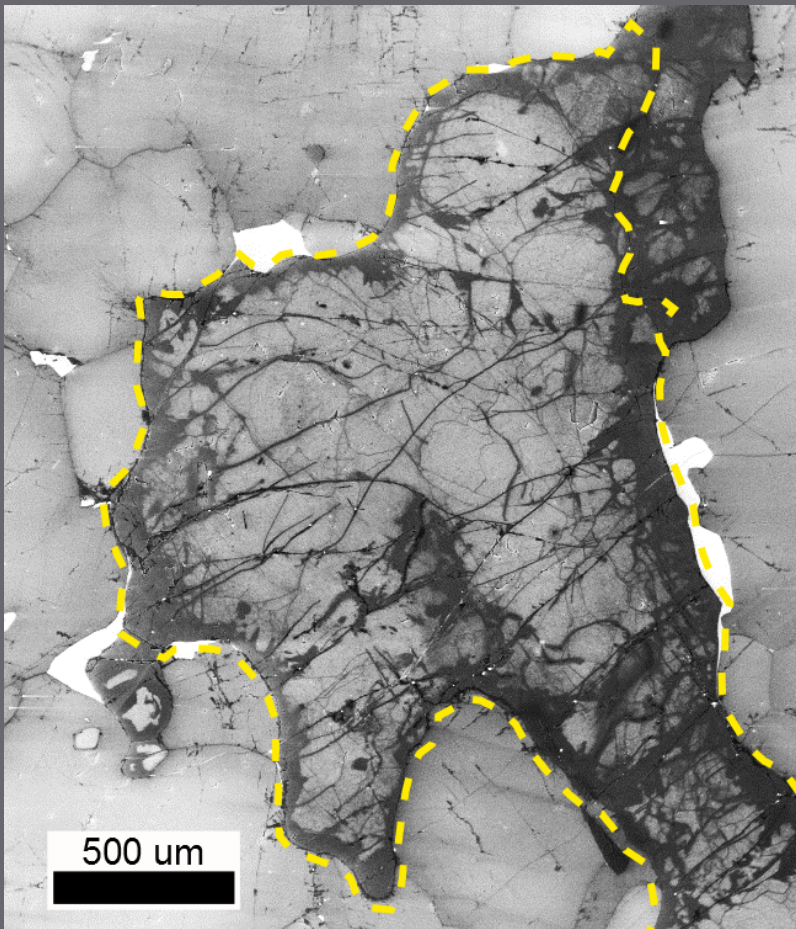
1. Dark mantle
2. Lines
 - a) Straight
 - b) Sinuous

Cross-cutting
Relationships

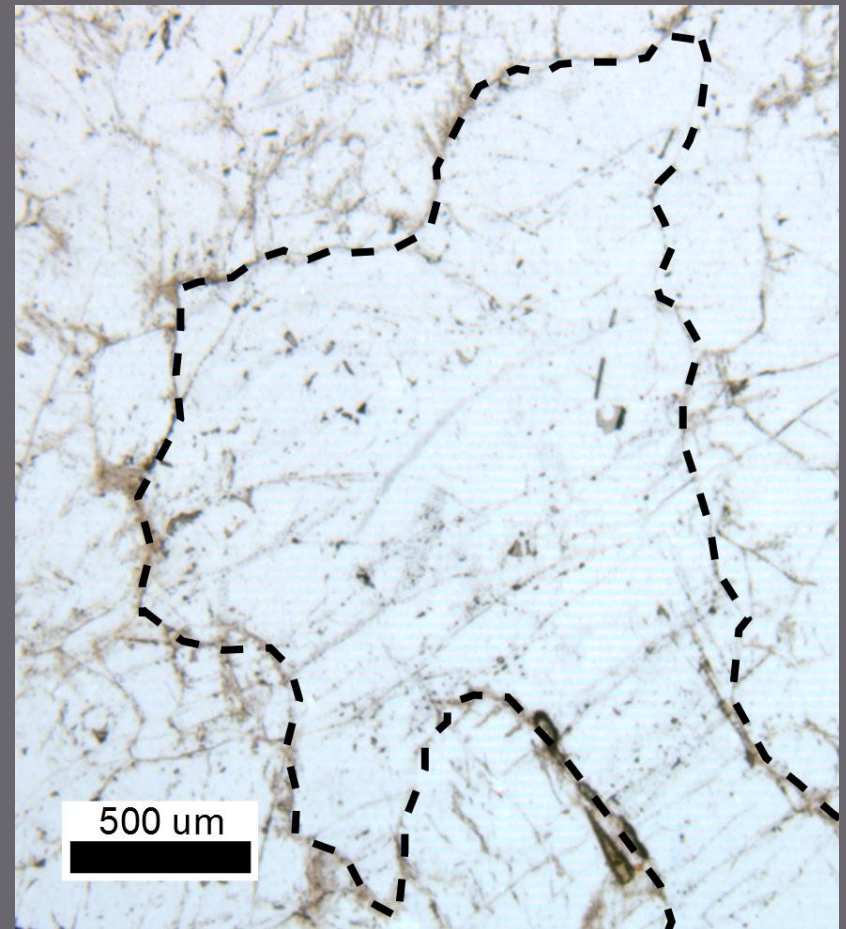


Correlation with Optical

CL

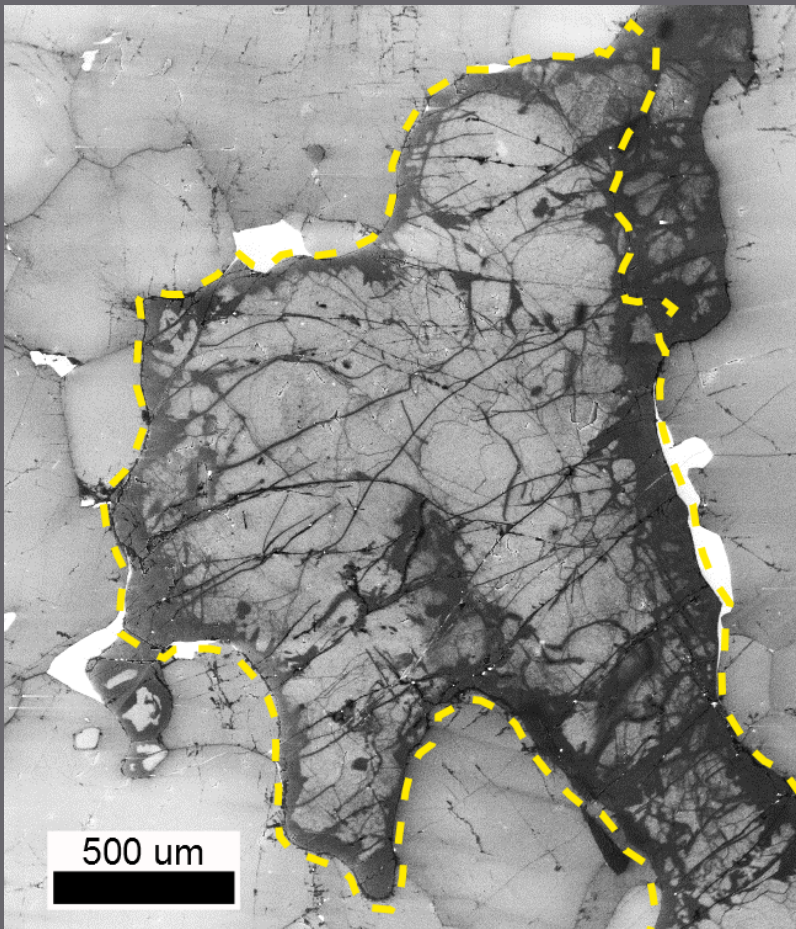


Optical

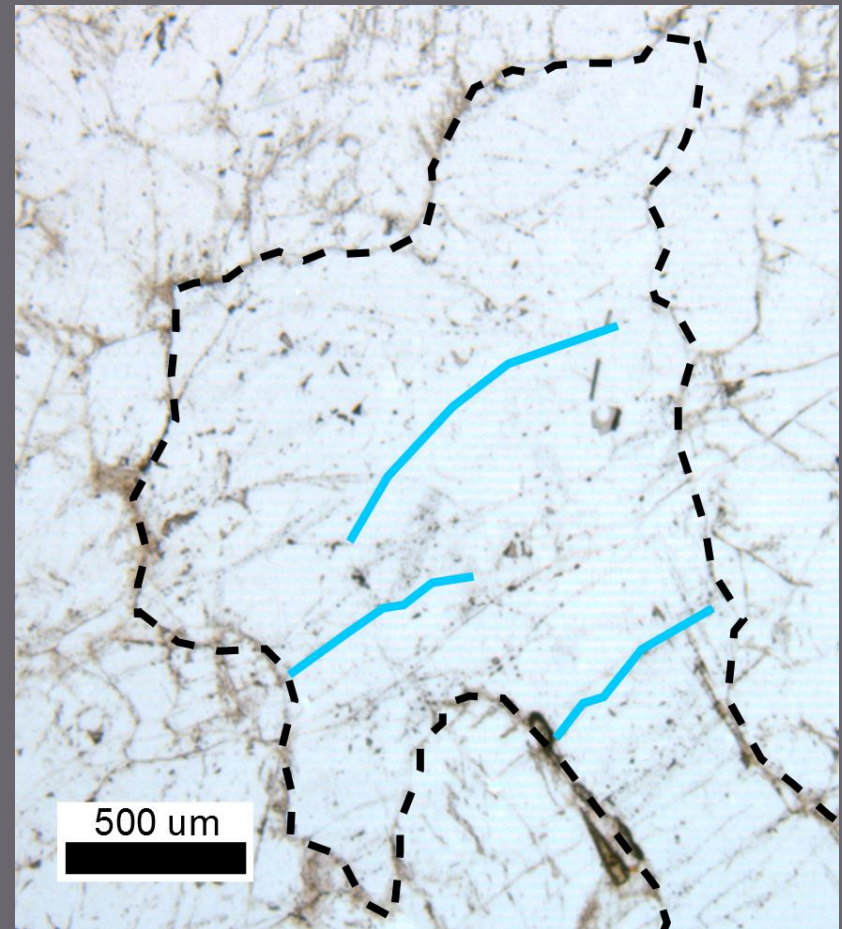


Correlation with Optical

CL

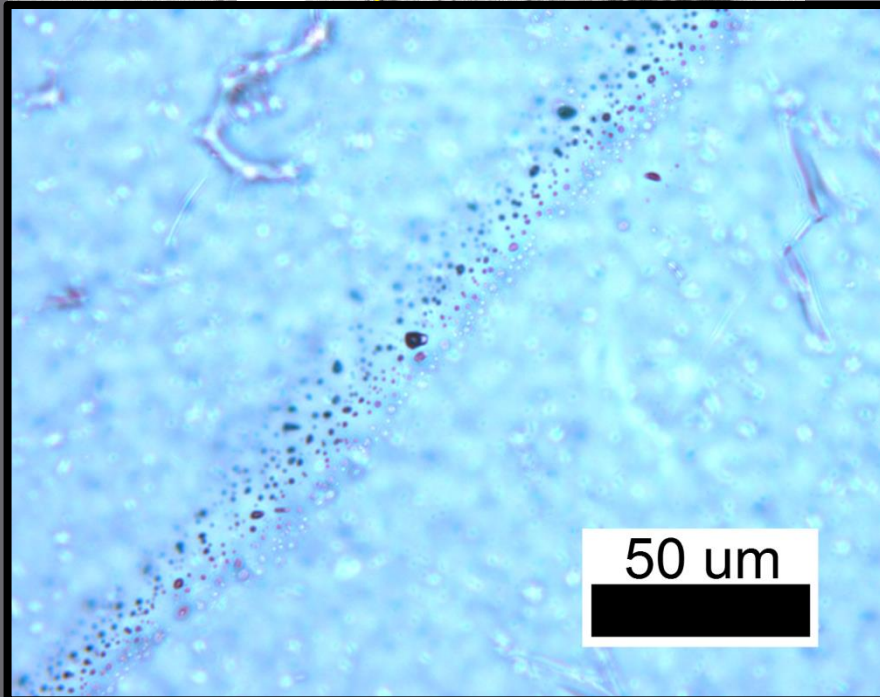
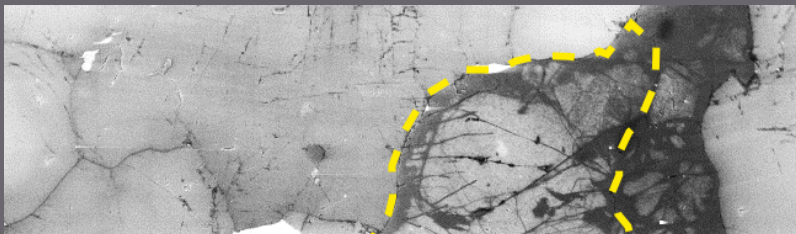


Optical

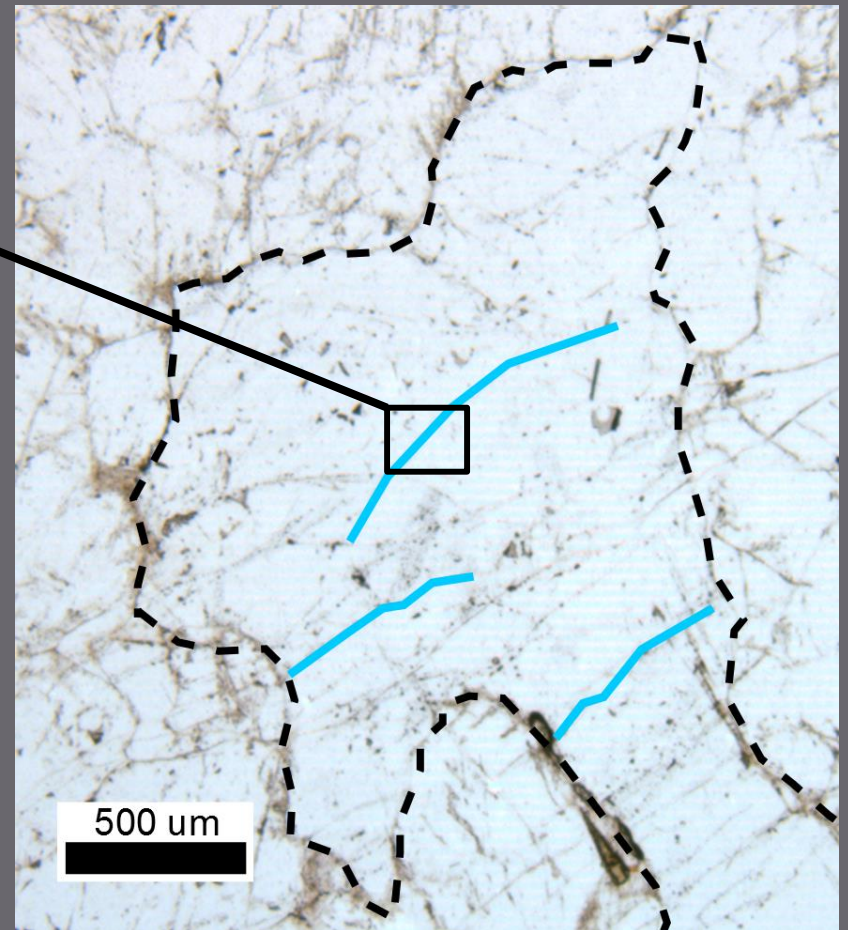


Correlation with Optical

CL

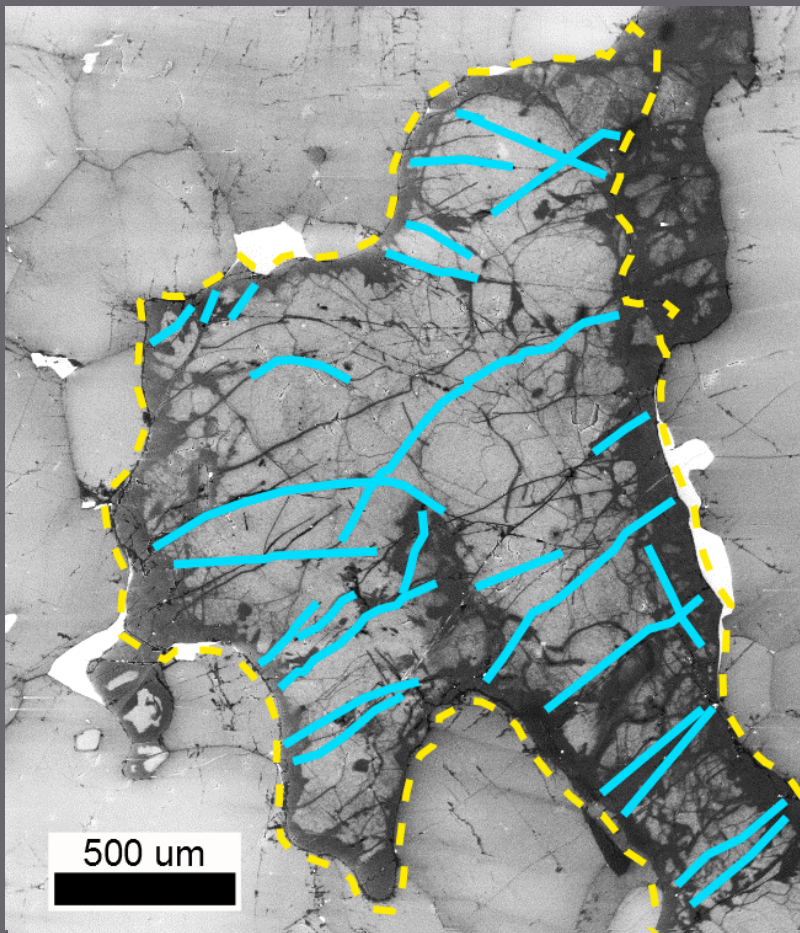


Optical

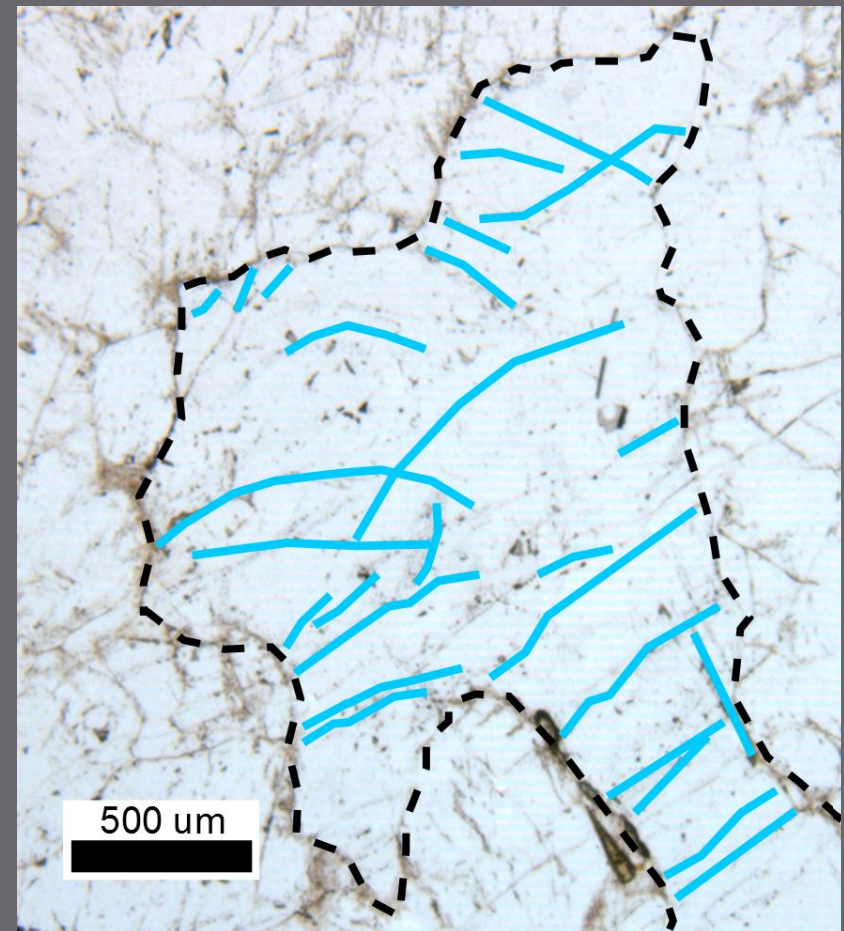


Correlation with Optical

CL

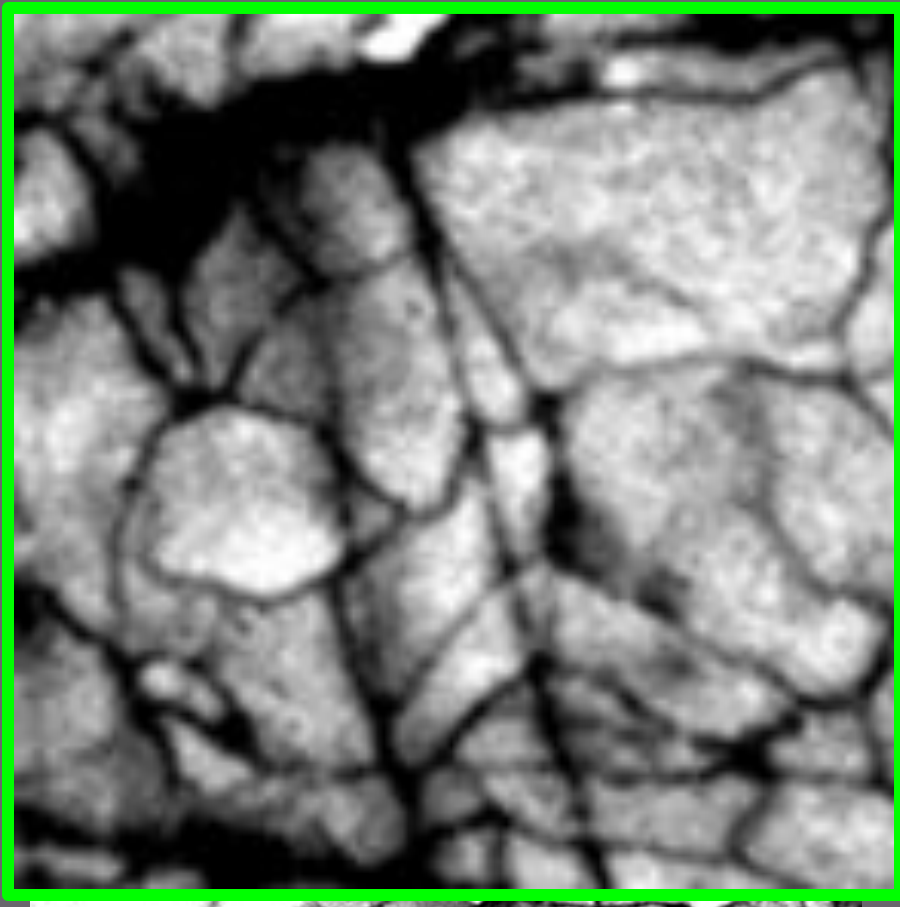


Optical

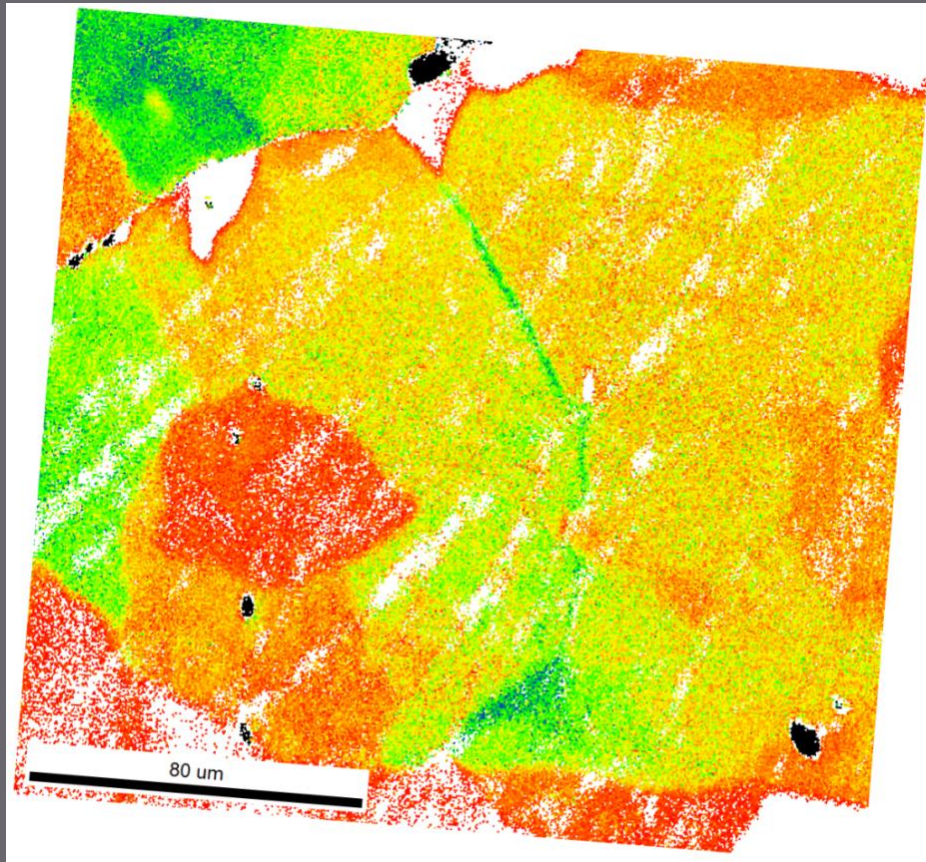


Correlation with Misorientation

CL

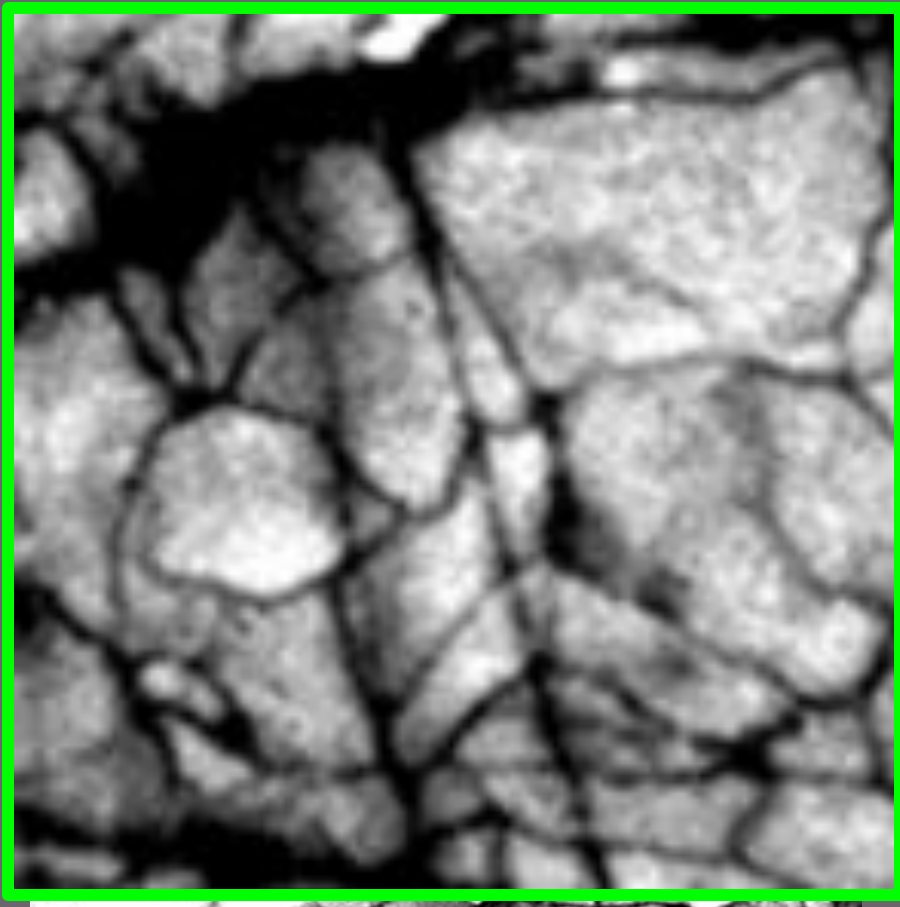


EBSD orientation map

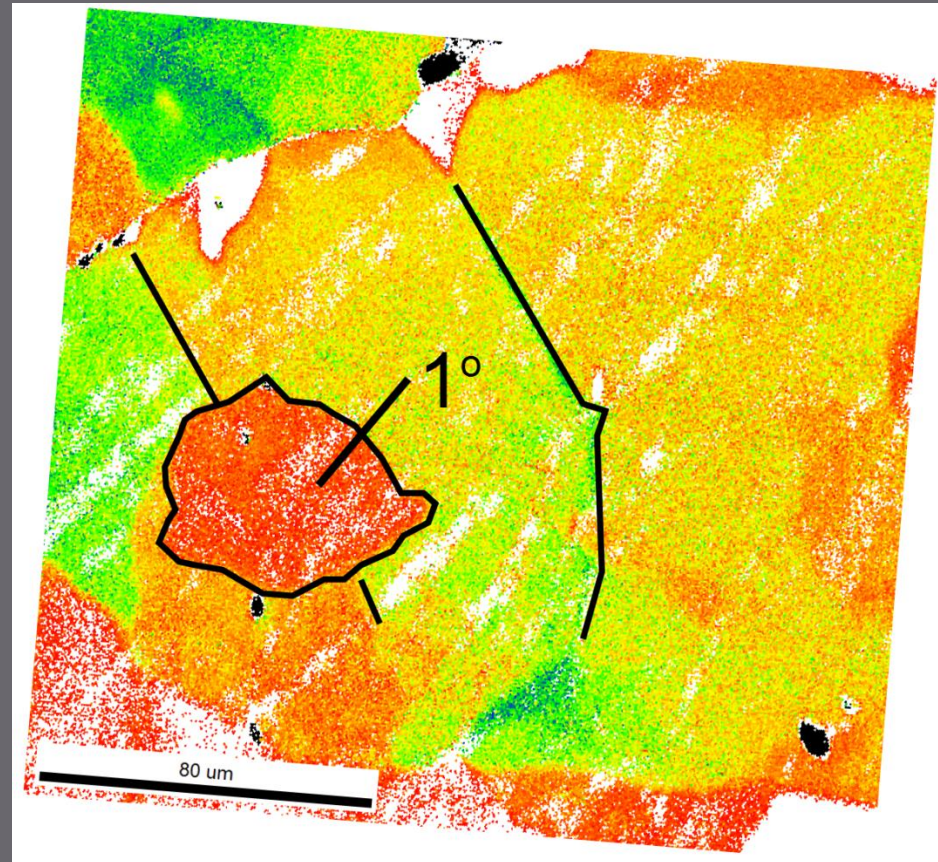


Correlation with Misorientation

CL

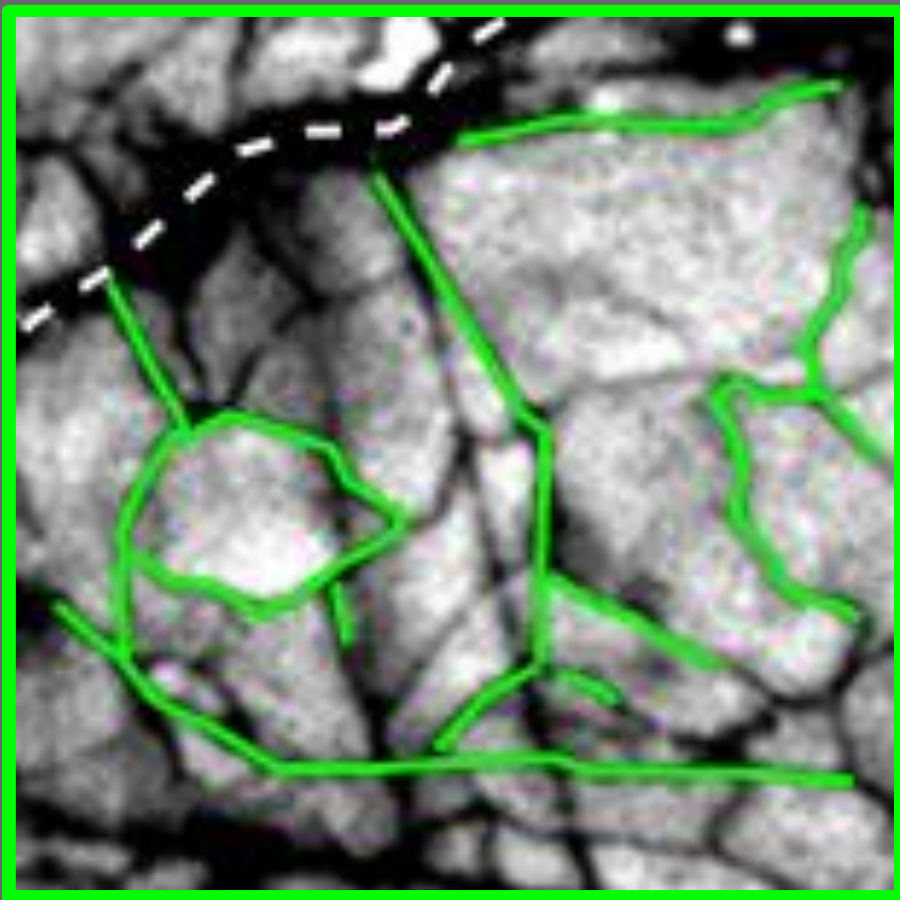


EBSD orientation map

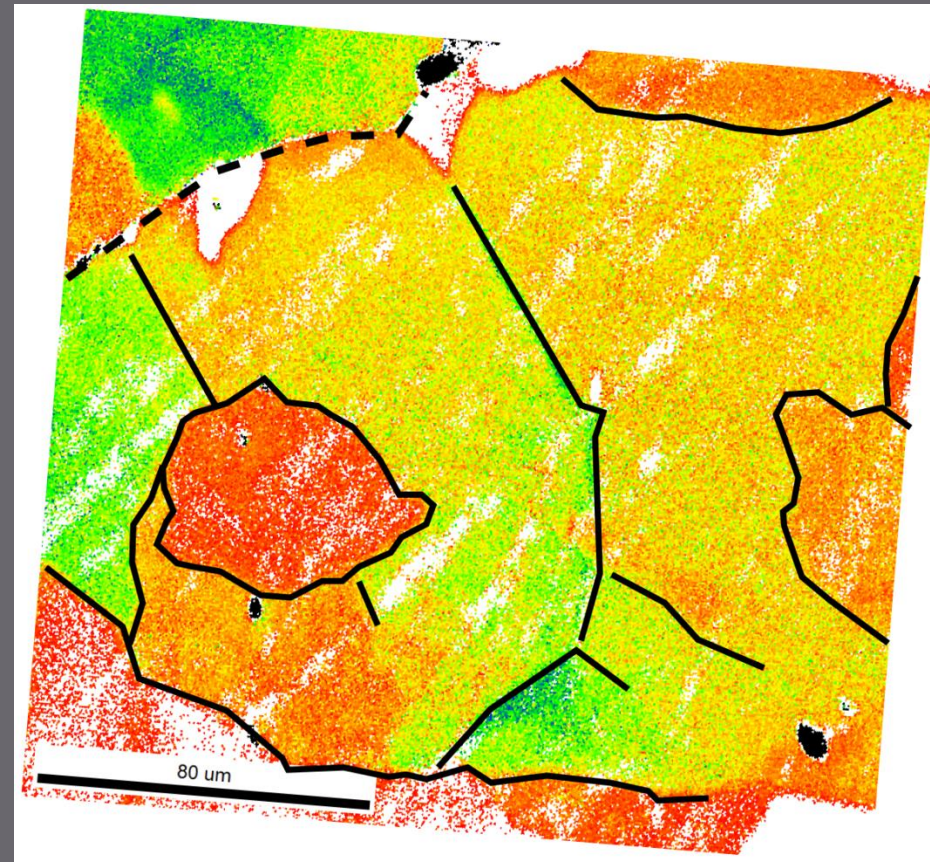


Correlation with Misorientation

CL



Areas of Slight
Misorientation (AOSM)



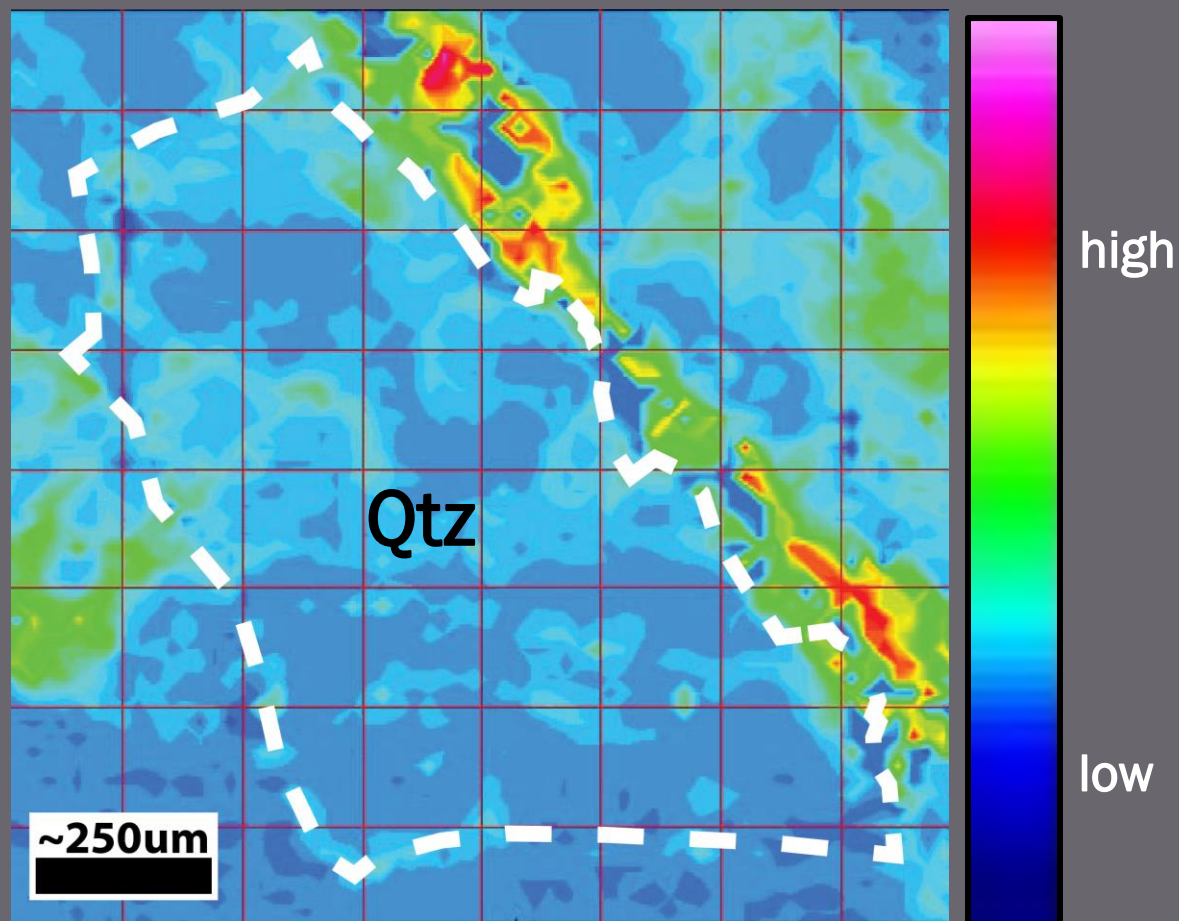
Correlation with Chemistry

Water Species Concentrations Fourier Transform Infrared Spectroscopy

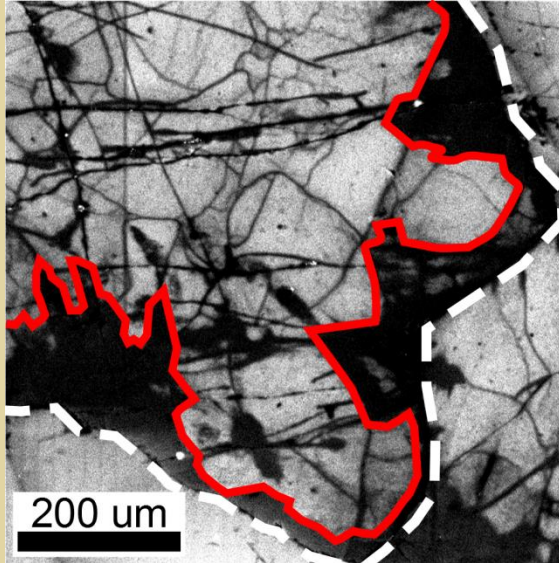
Ti & Al

??

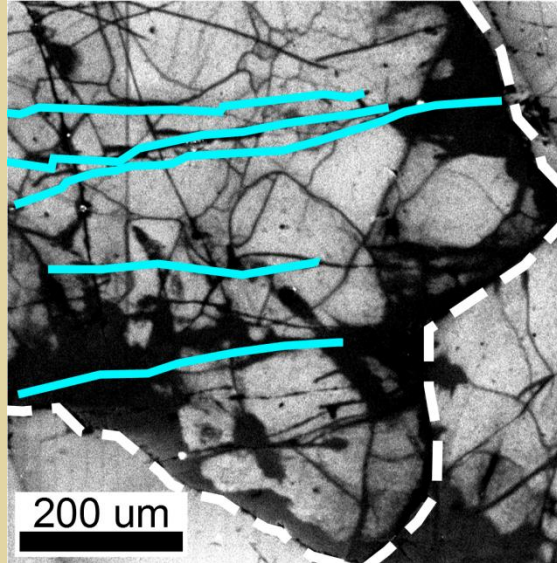
Water species,
maybe



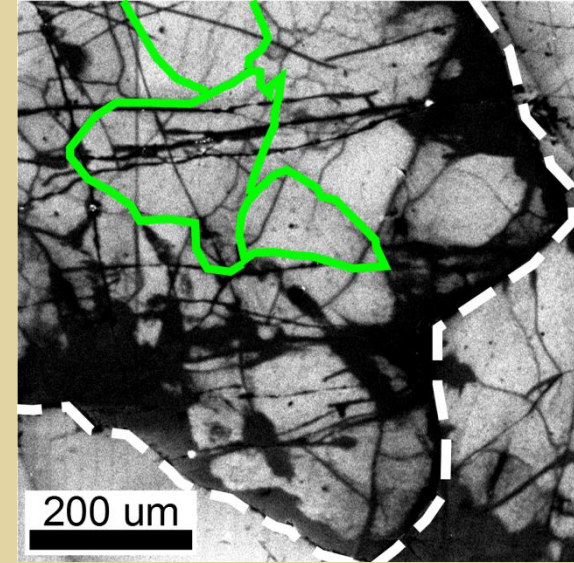
Mantles



Straight Lines



Sinuous Lines



inclusion trails

Areas of Slight
Misorientation (AOSM)

Recrystallization
Precipitation
Diffusion

Fracture

e.g.
Hydrofracturing

e.g.
~1% volume
decrease at beta-
alpha quartz
transition

