

Online Resource ESM5

Journal: Mineralogy and Petrology

Episodic diamond growth beneath the Kaapvaal Craton at Jwaneng Mine, Botswana

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Kohn⁴ • Quint van den Heuvel¹ • Ellen Schulten¹ • Anna S.M. Pals¹ • Gareth R. Davies¹**



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Online Resource ESM5 Illustration of individual FTIR spots of 79 diamond plates from Jwaneng

Note: The locations of individual FTIR spots are superimposed on the cathodoluminescence images of 79 diamond plates as listed in Table ESM4. For individual traverses N aggregation (%B) and N content (at.ppm) are plotted against distance. The bottom plot shows the N content in log scale against %B for the corresponding traverse. Coloured markers in the graphs are subdivided into major growth zones based on the FTIR data obtained in the core (circle), intermediate (diamond) and rim (square) zones. Isotherms for hypothetical mantle residence times of 2.66, 1.26 and 0.76 billion years, based on inferred diamond formation ages at 1.0, 1.5 and 2.9 Ga and are corrected for the 240 Ma emplacement age of the Jwaneng kimberlites, illustrate the potential thermal evolution across individual major growth zones of diamond plates.

SAMPLE

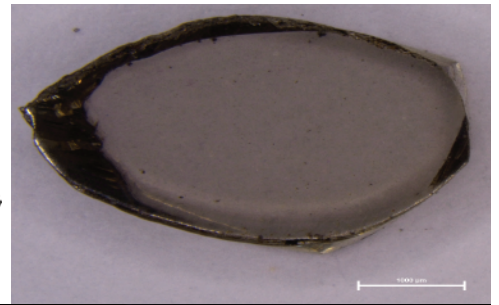
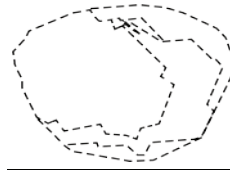
group:
aperture in μm

Growth zonation
sketch inferred
from FTIR data

Transmitted light image
of the diamond plate

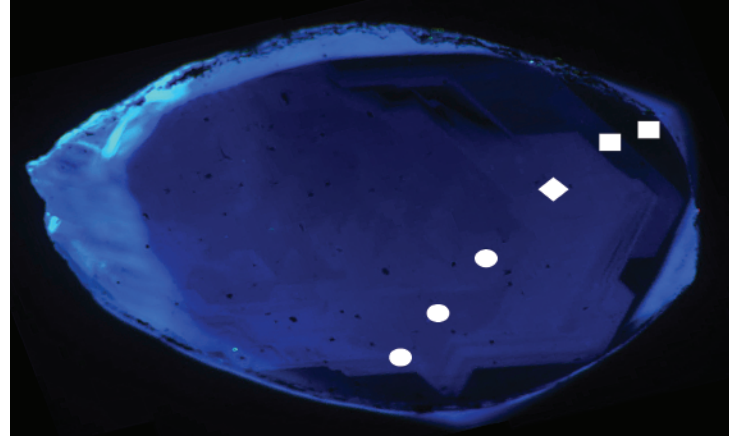
JW003

group: C2
aperture: $60\mu\text{m}$



Cathodoluminescence image
of the diamond plate

Markers represent individual
spots in major growth zones of
core (circle), intermediate
(diamond) and rim (square)



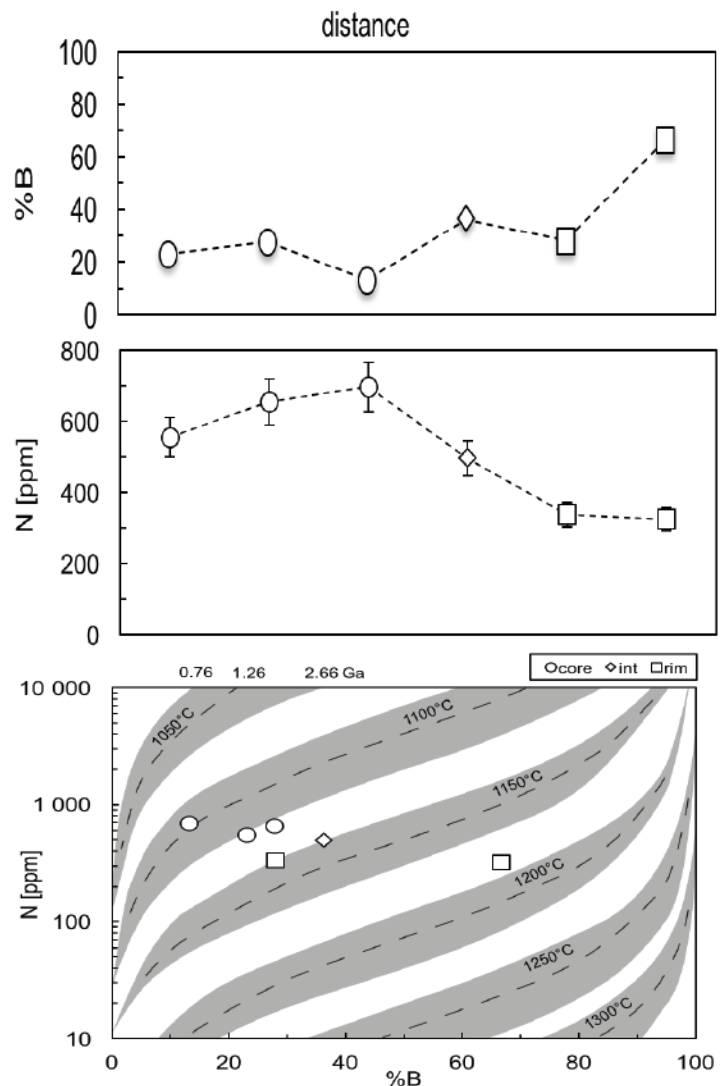
Nitrogen aggregation in %B of individual
spots on the diamond plate.

Markers that are only plotted in the CL
image but not in the graphs are below
detection limit (< 20 at. ppm N; Type IIa).

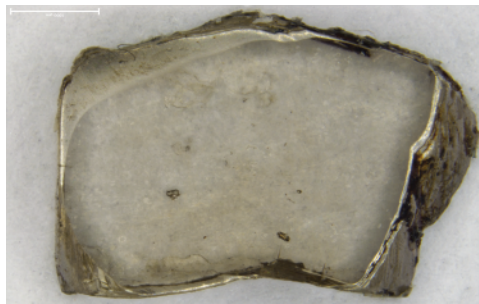
Nitrogen content in atomic ppm (ppm)
of individual spots on the diamond
plate

Nitrogen content vs aggregation of
individual spots on the diamond plate.

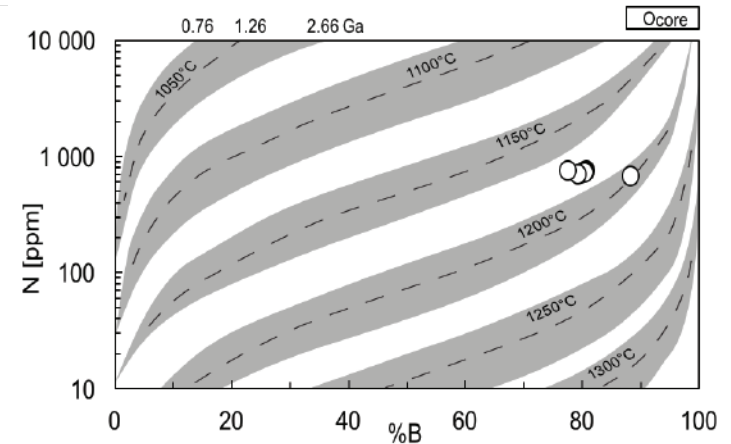
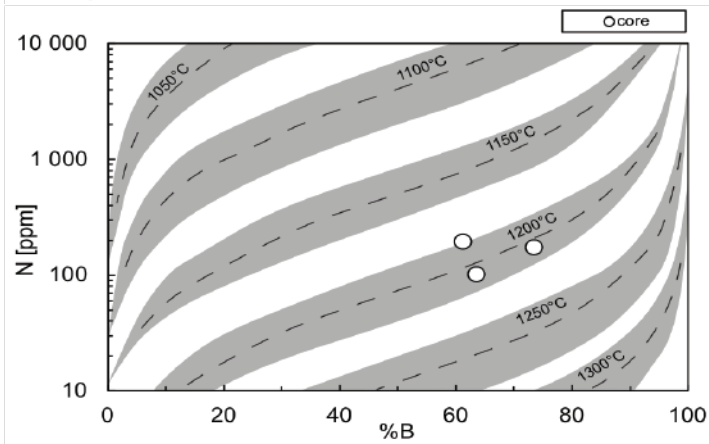
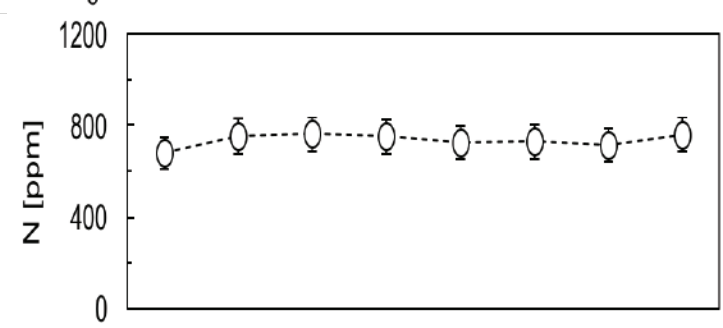
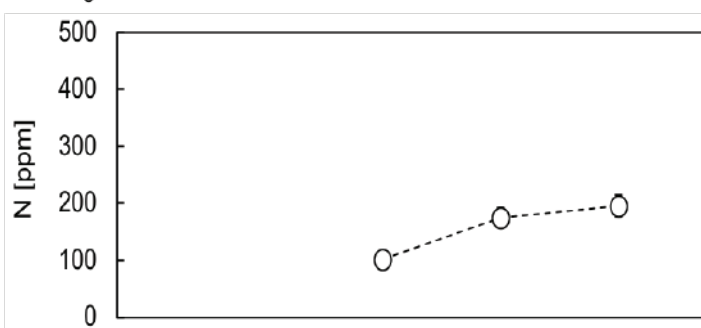
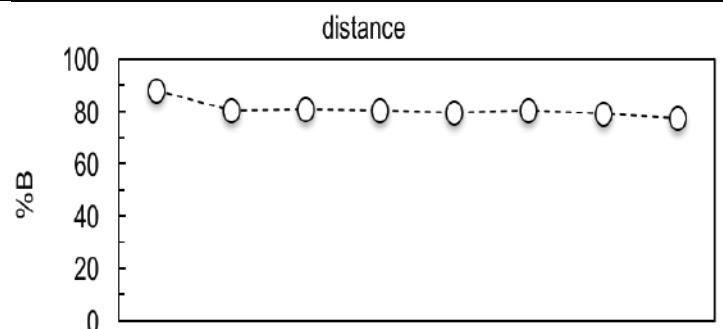
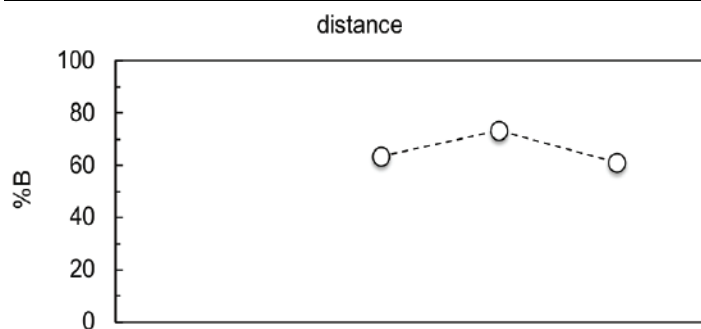
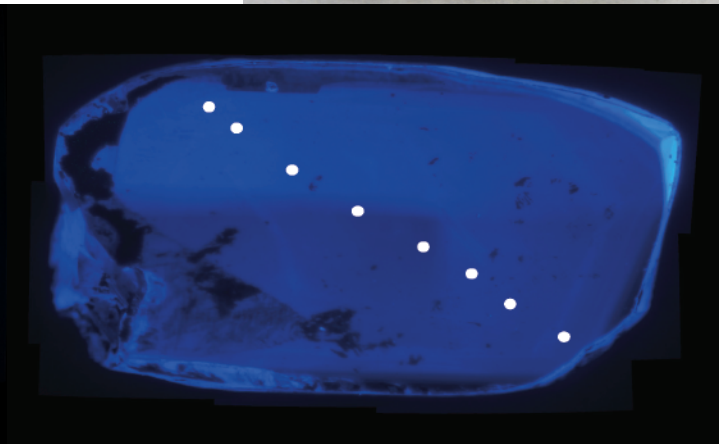
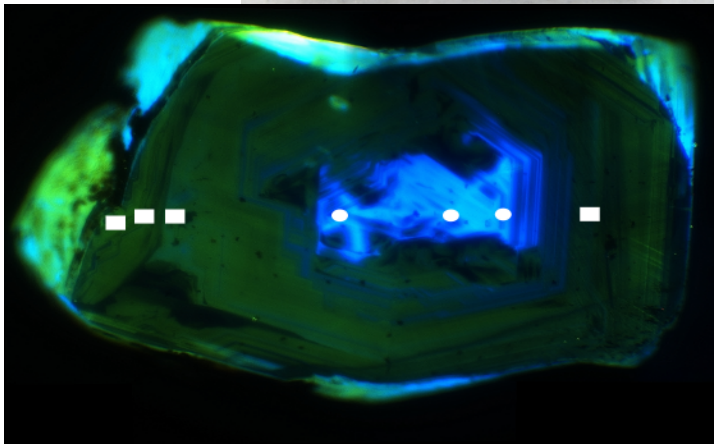
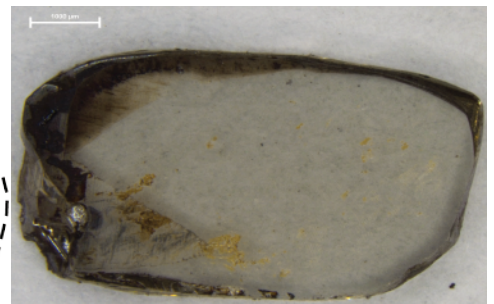
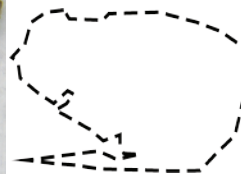
Isotherms at 0.76 (left grey border of
dashed lines), 1.26 (dashed lines)
and 2.66 (right grey border of dashed
lines) Ga are calculated for inferred
diamond formation ages from litera-
ture at 1.0, 1.5 and 2.9 Ga and are
corrected for the 240 Ma emplace-
ment age of the Jwaneng kimberlites.



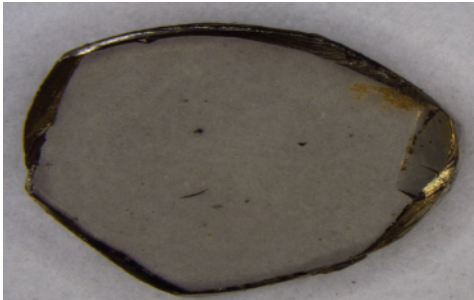
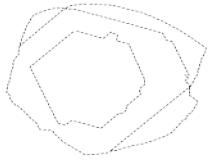
JW014
group: C2
aperture: 50µm



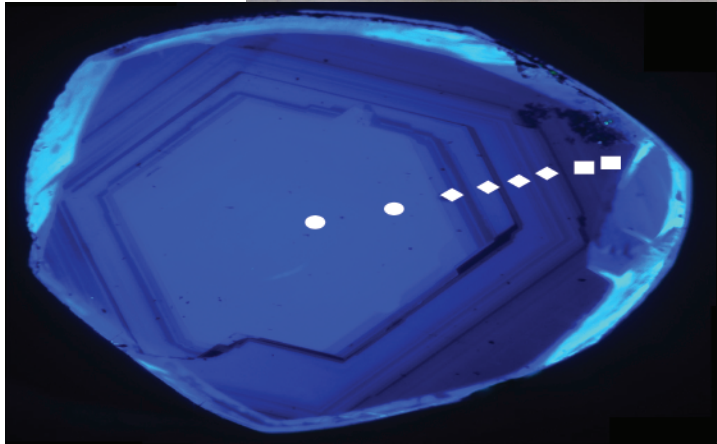
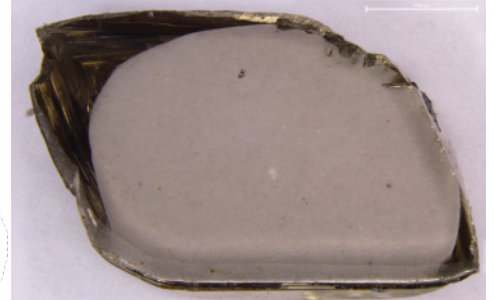
JW020
group: B
aperture: 50µm



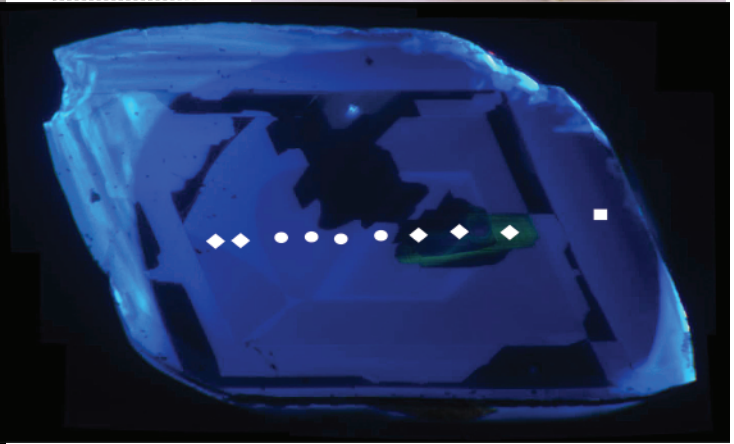
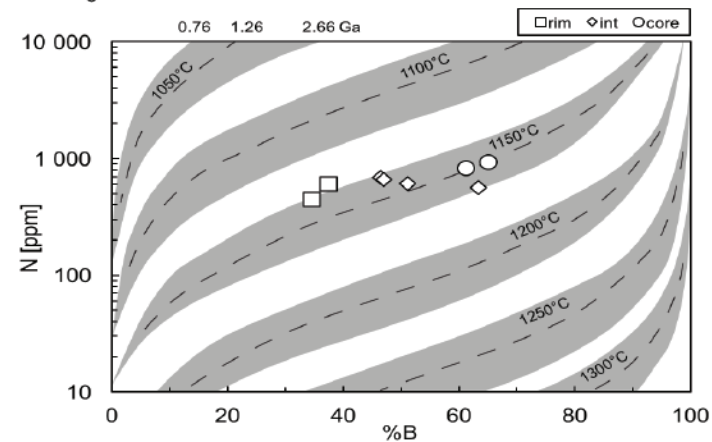
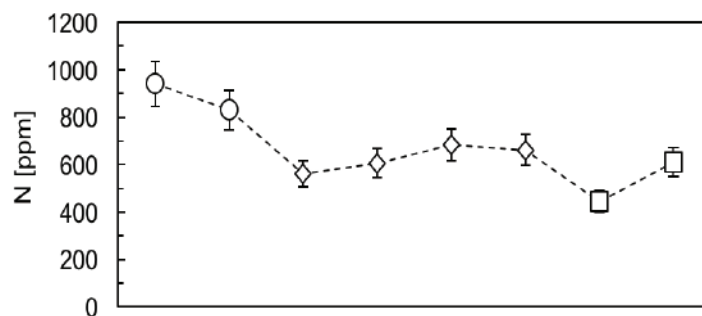
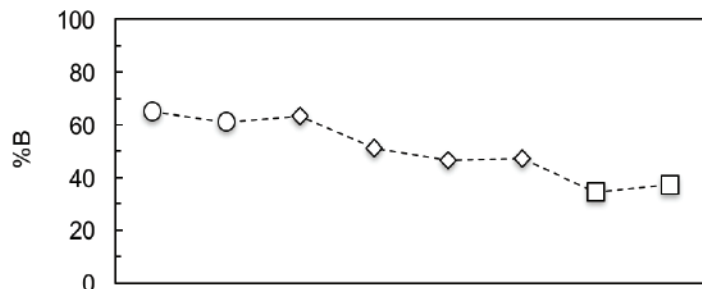
JW024
group: C2
aperture: 60 μ m



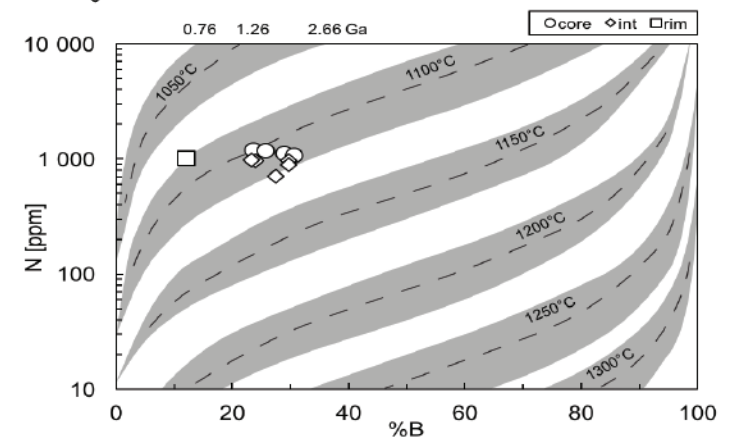
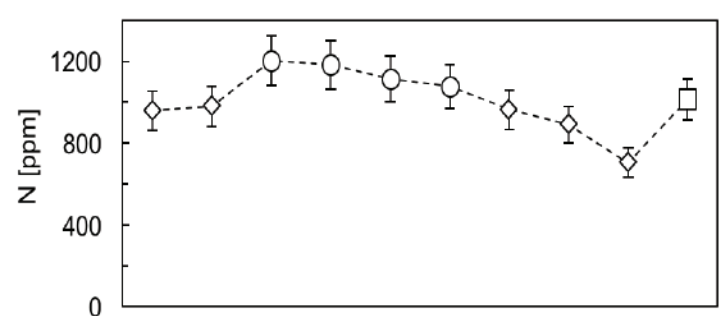
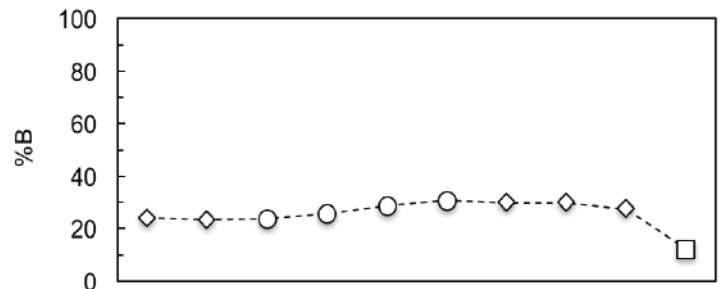
JW027
group: C2
aperture: 75 μ m



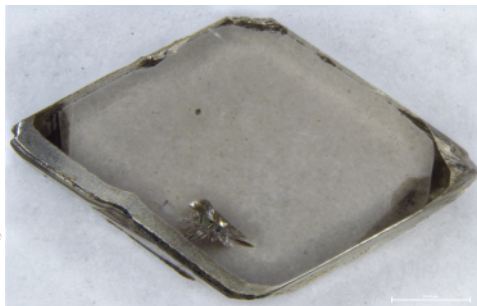
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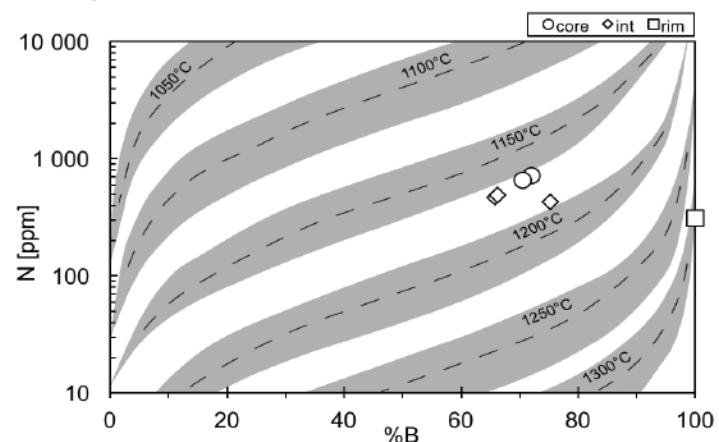
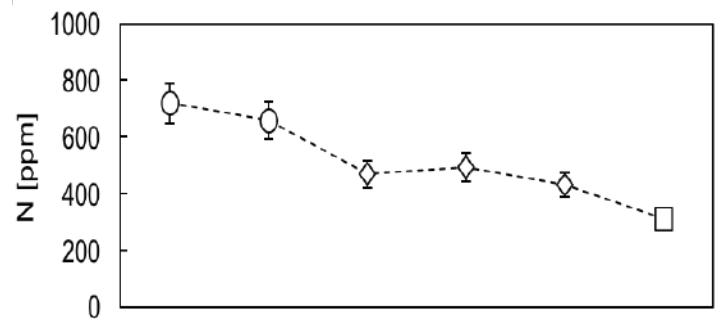
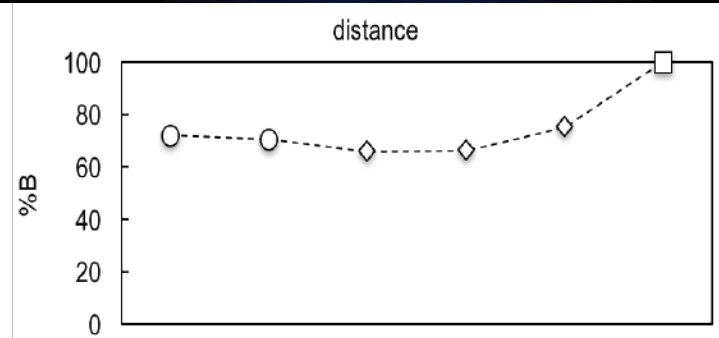
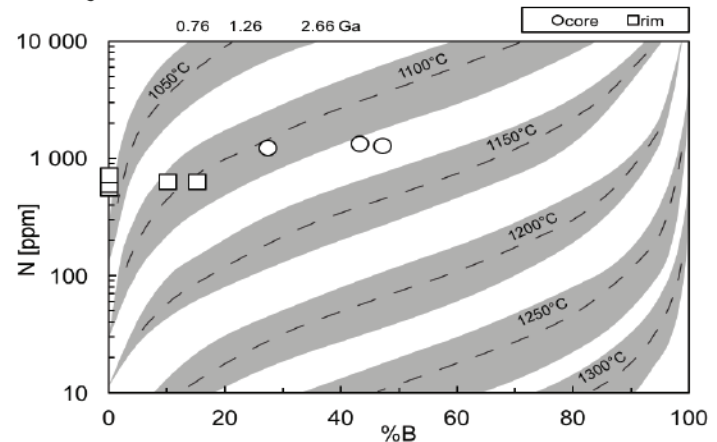
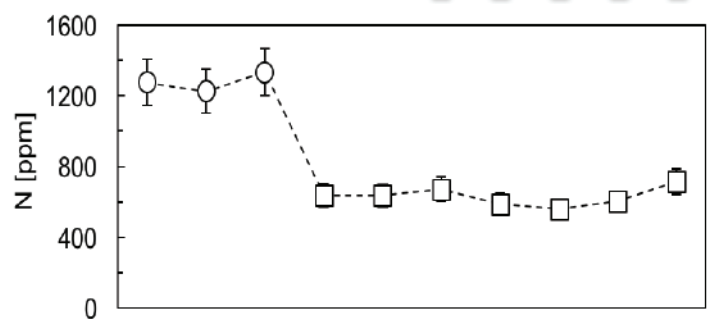
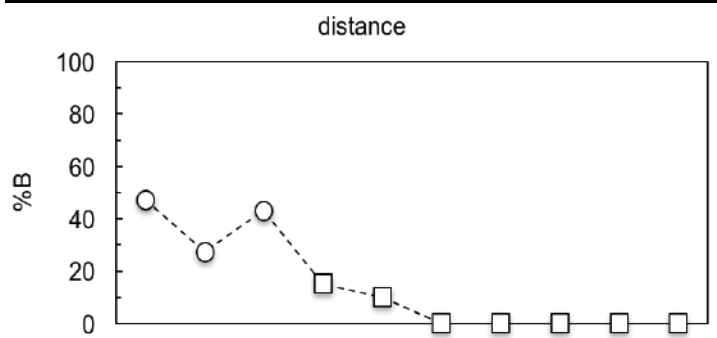
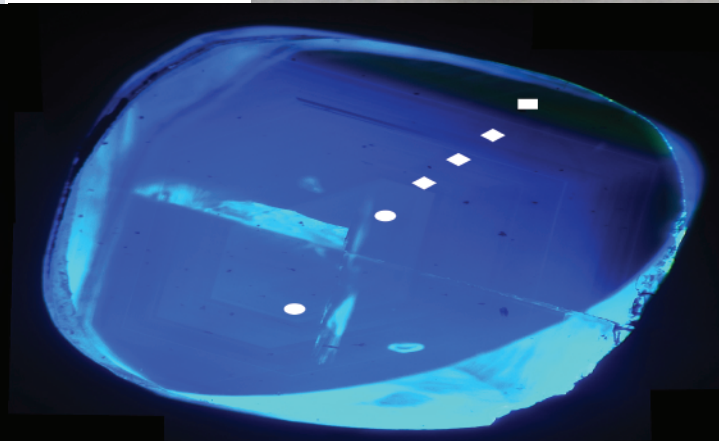
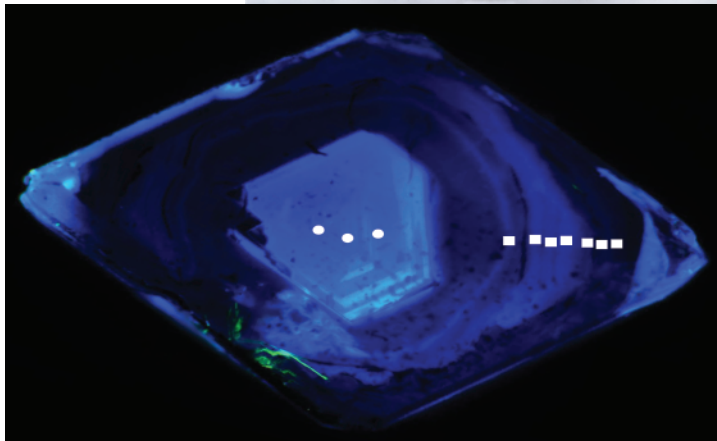
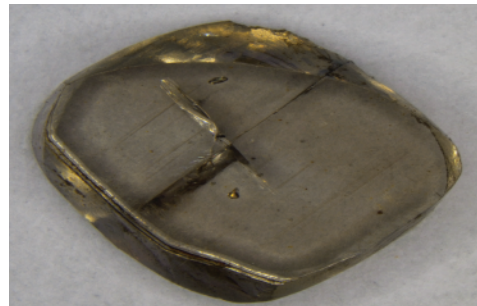
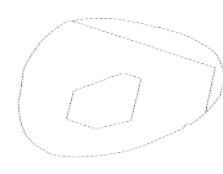
distance



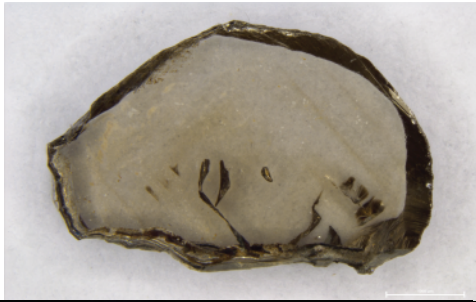
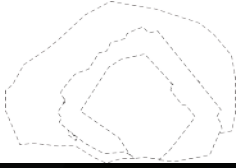
JW029
group: C2
aperture: 70 μ m



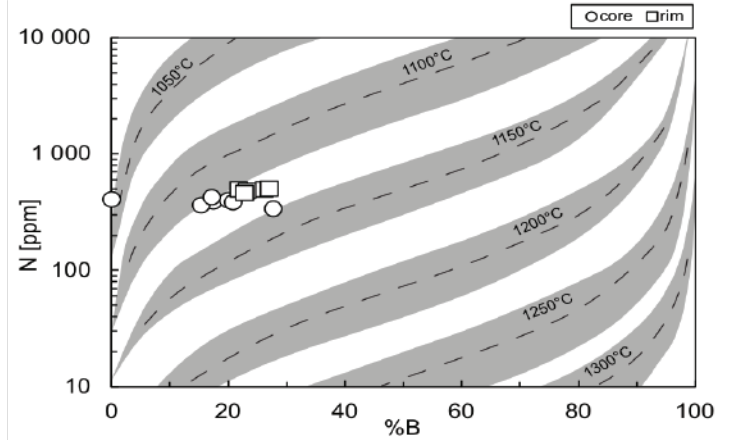
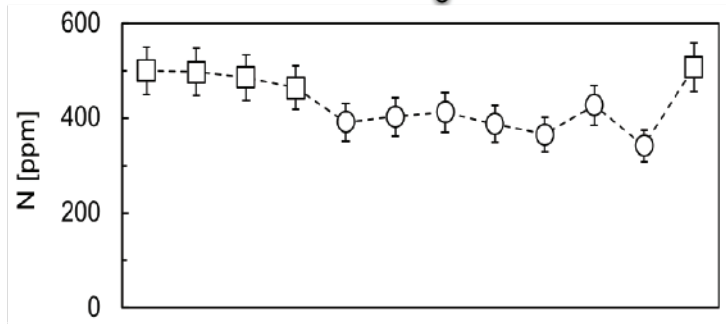
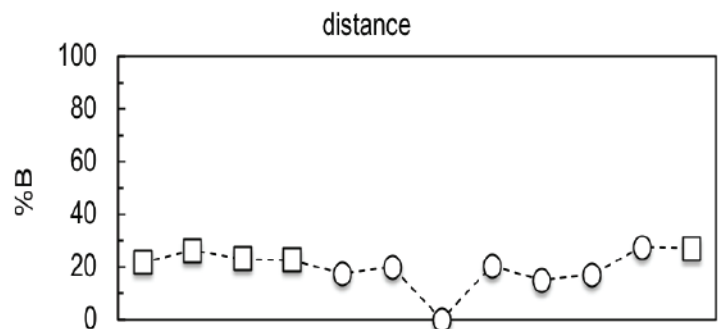
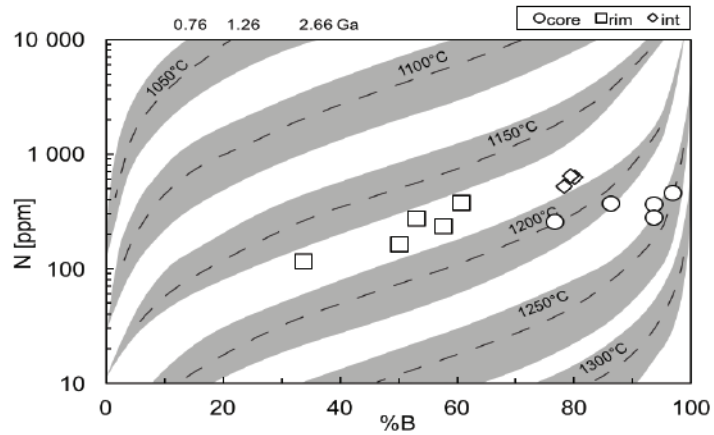
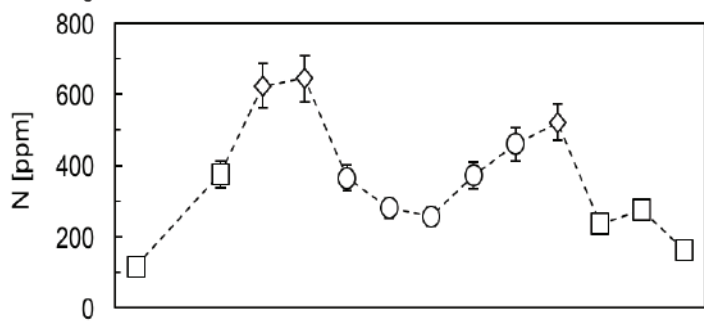
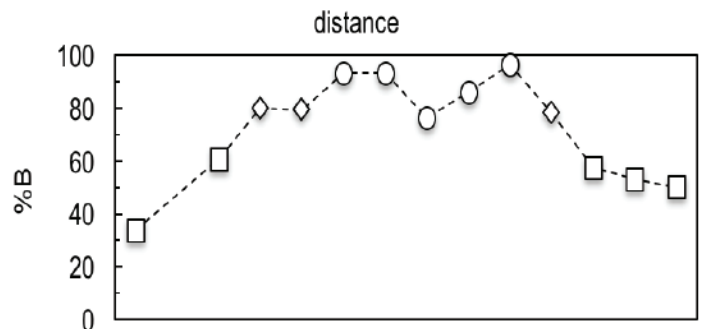
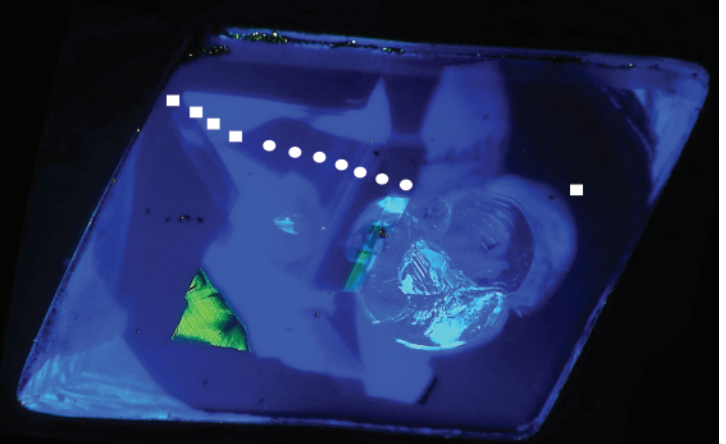
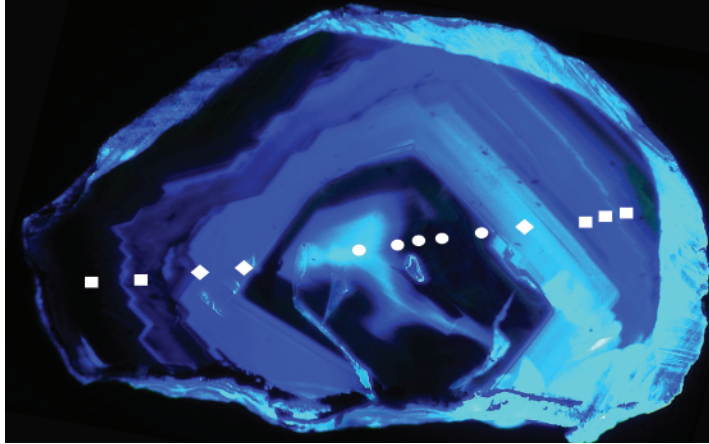
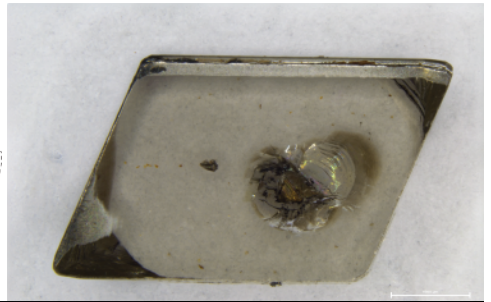
JW030
group: C2
aperture: 50 μ m



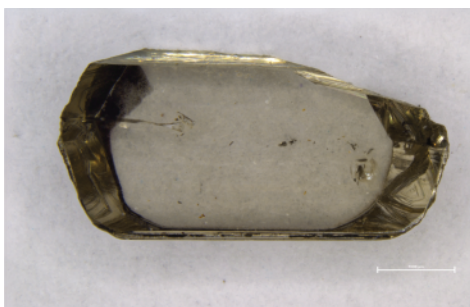
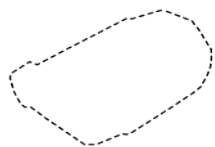
JW033
group: C1
aperture: 50 μ m



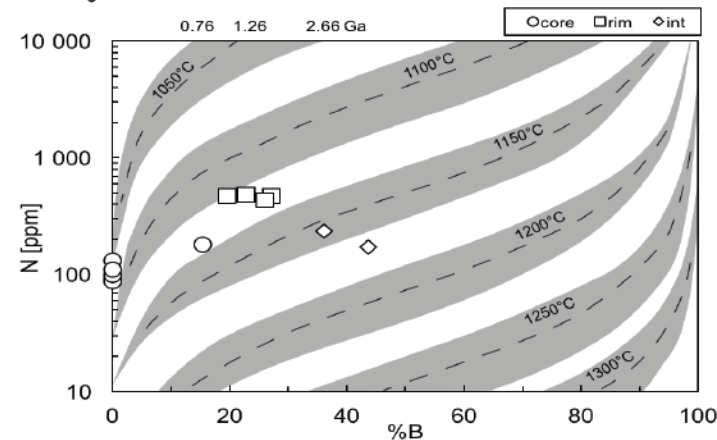
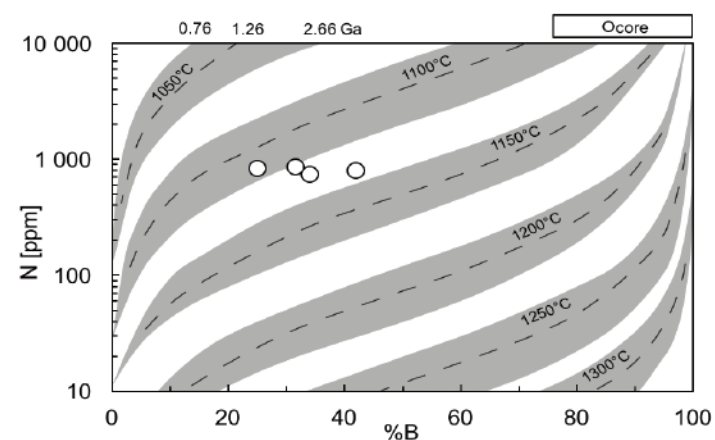
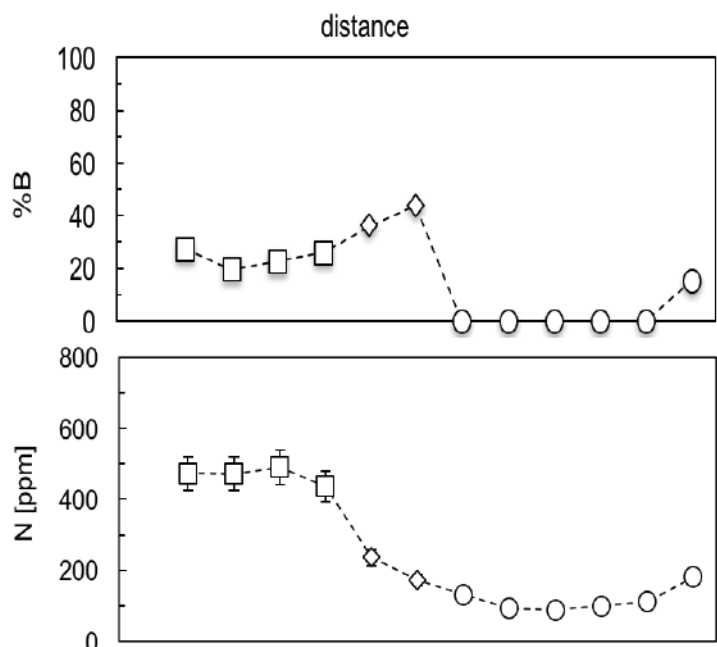
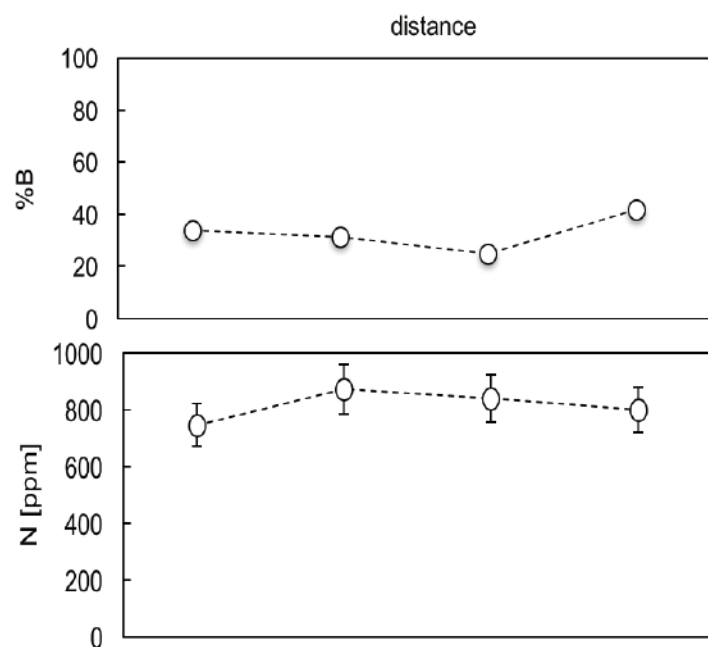
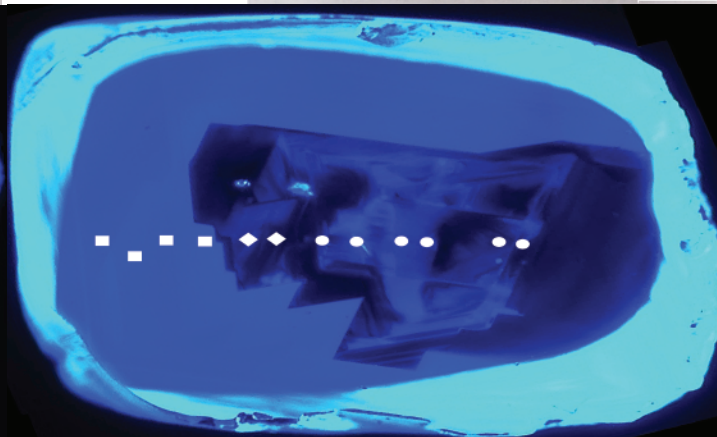
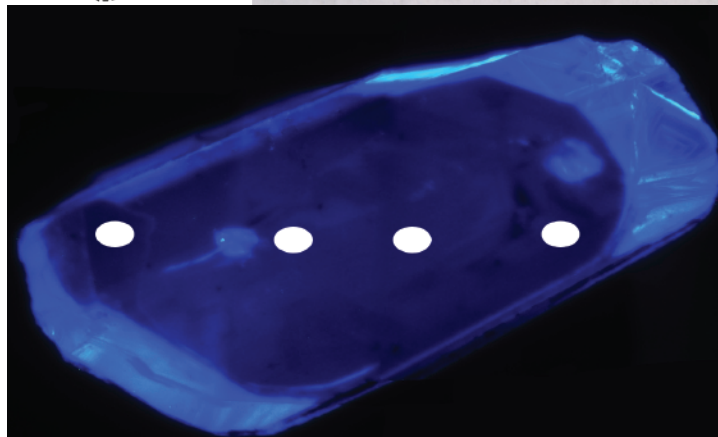
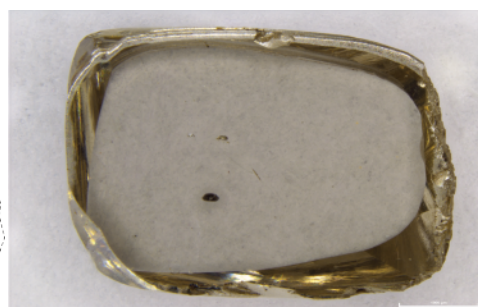
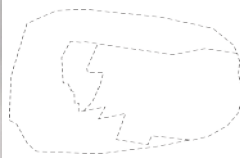
JW043
group: C1
aperture: 75 μ m



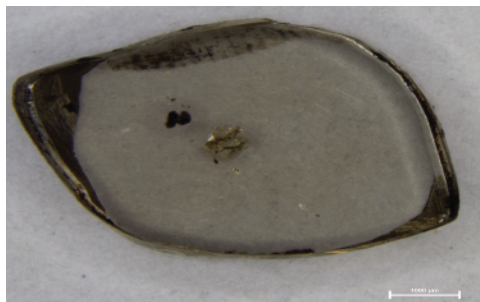
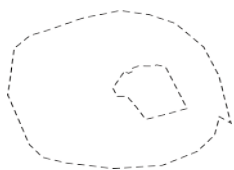
JW044
group: B
aperture: 100 μ m



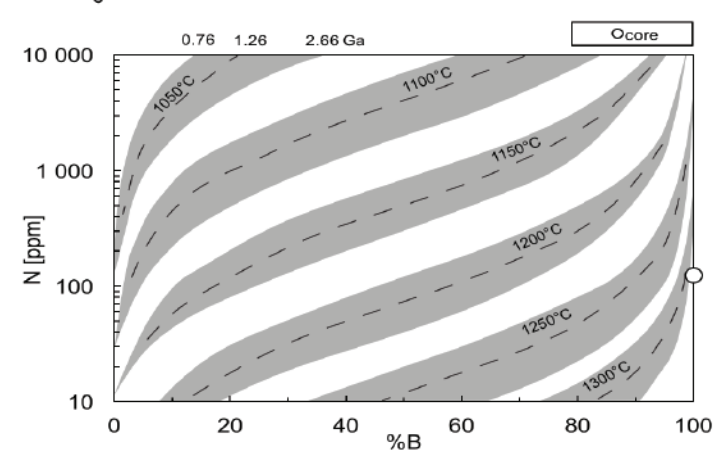
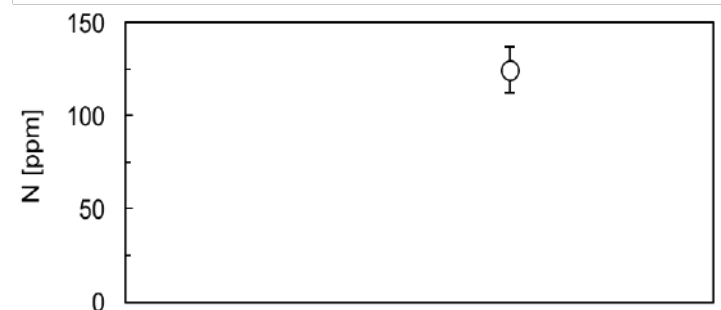
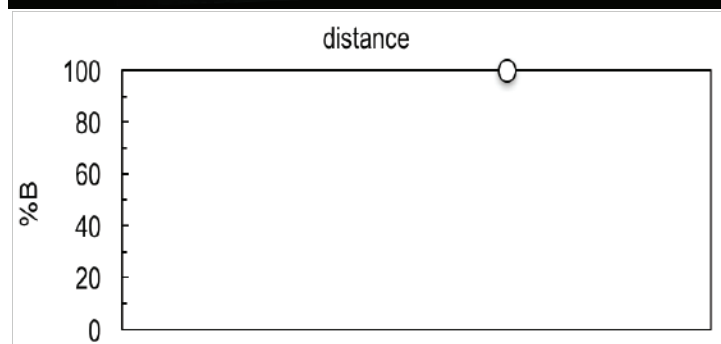
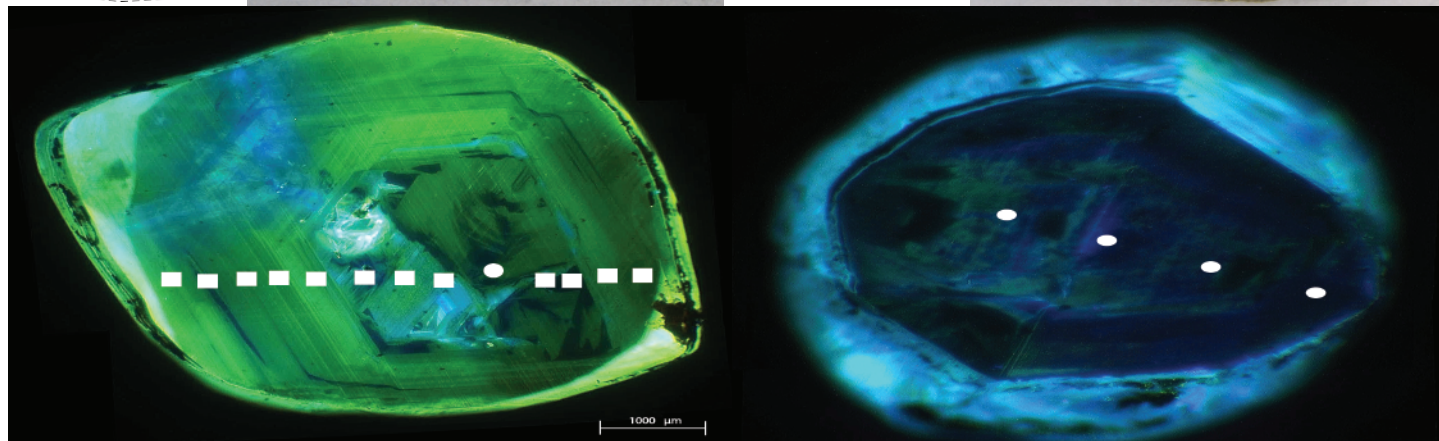
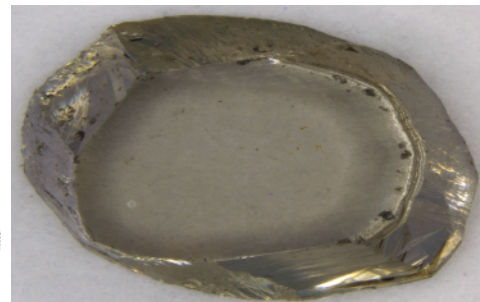
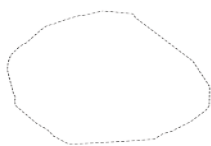
JW045
group: C1
aperture: 70 μ m



JW047
group: C2
aperture: 65 μ m

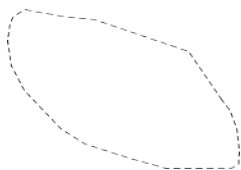


JW048
group: A
aperture: 80 μ m



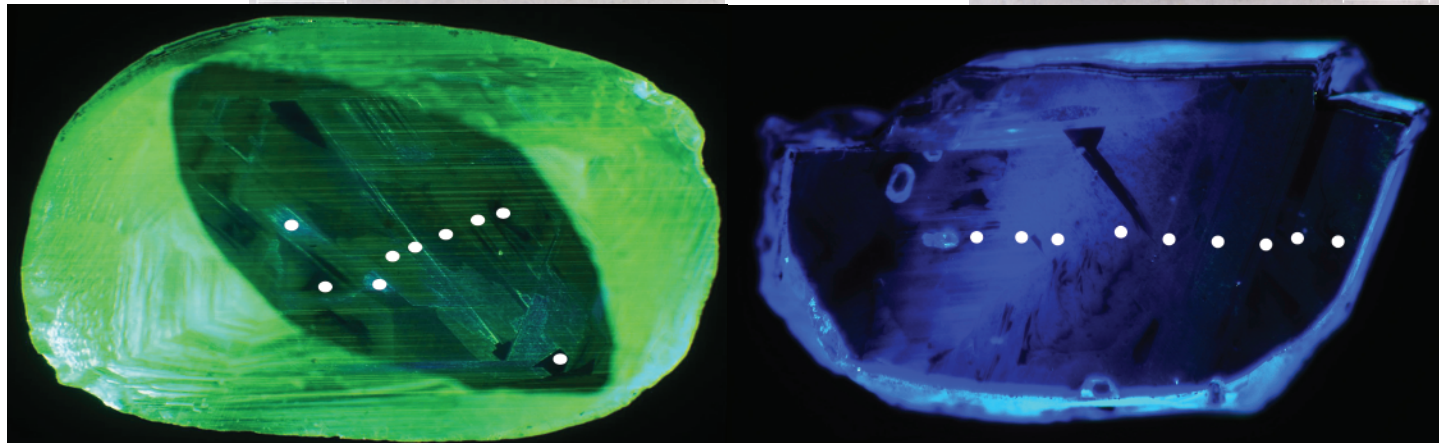
JW049

group: A
aperture: 75µm



JW058

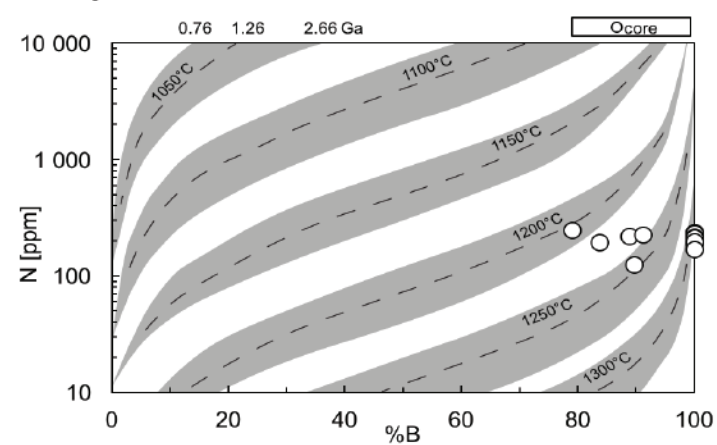
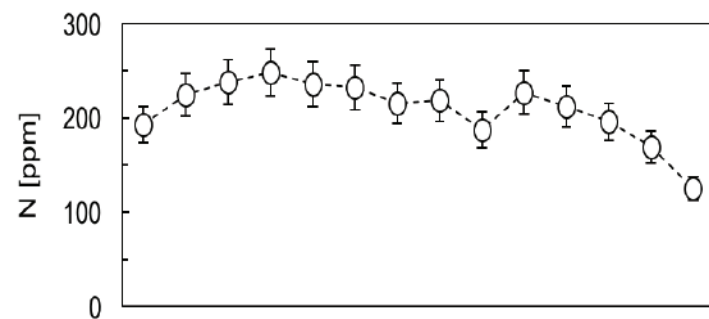
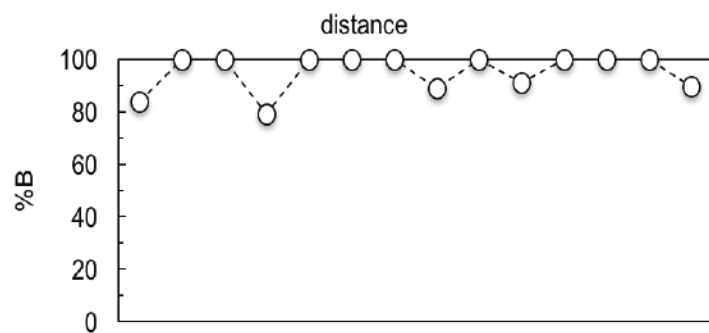
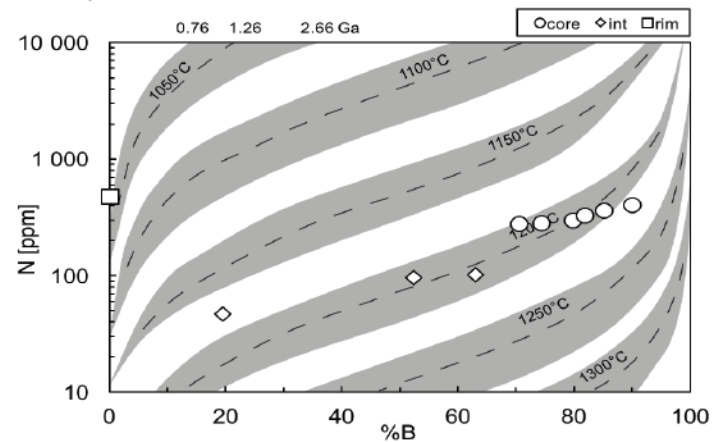
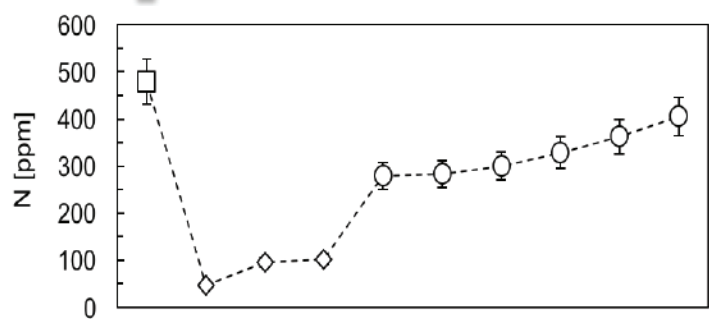
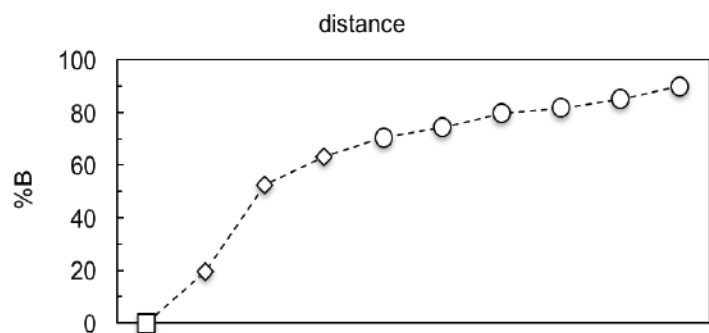
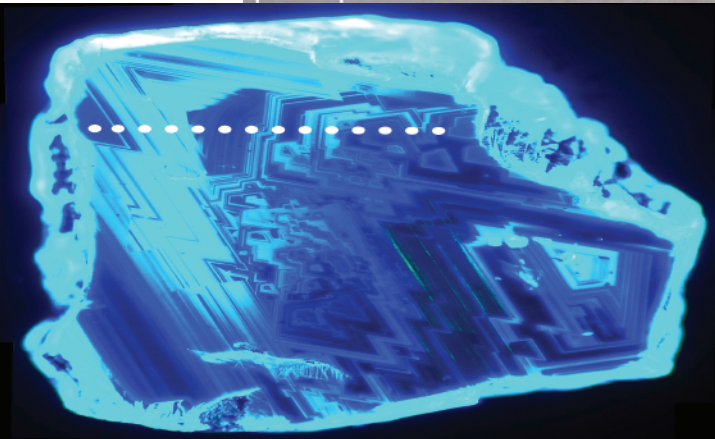
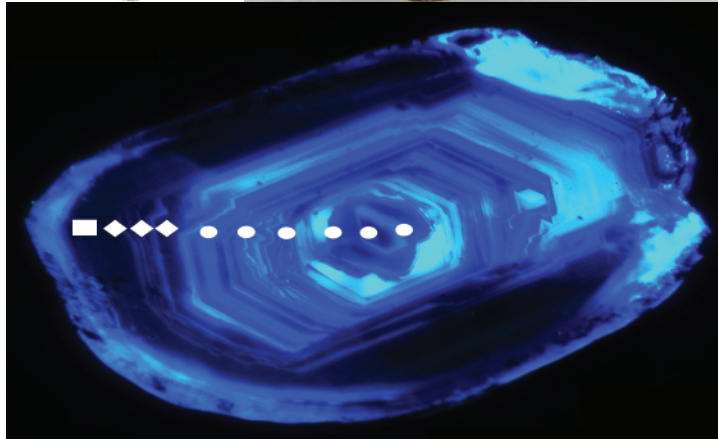
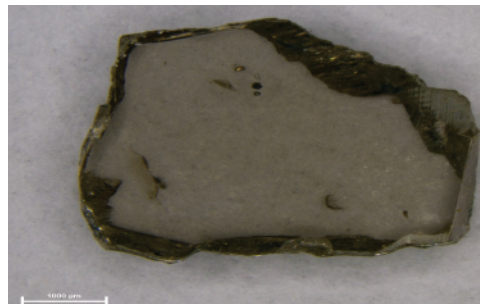
group: A
aperture: 80µm



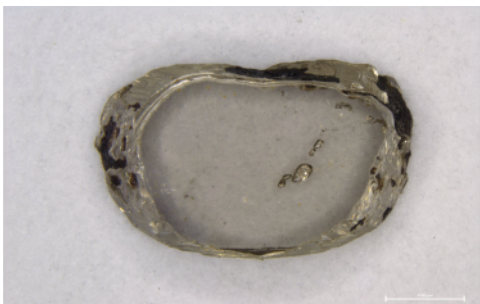
JW060
group: C3
aperture: 60 μm



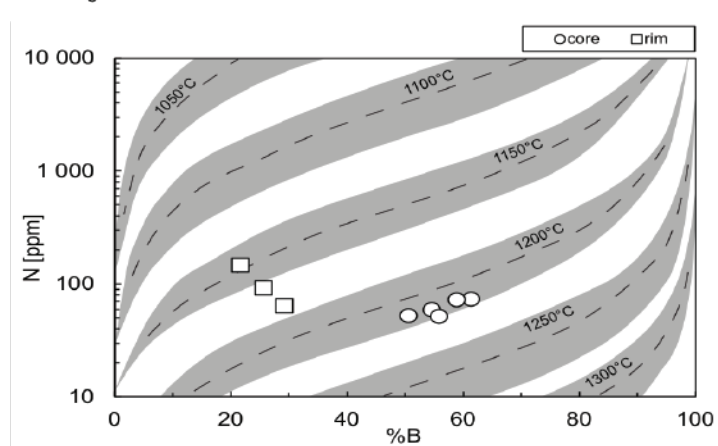
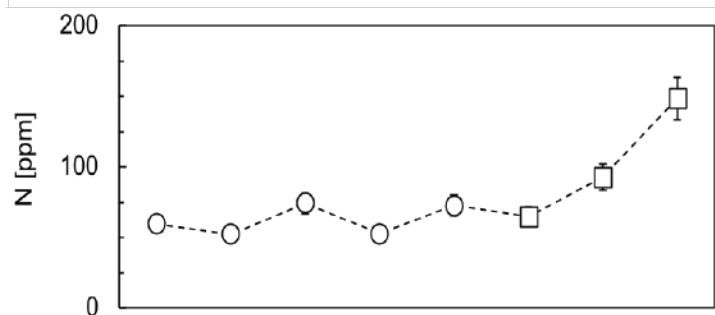
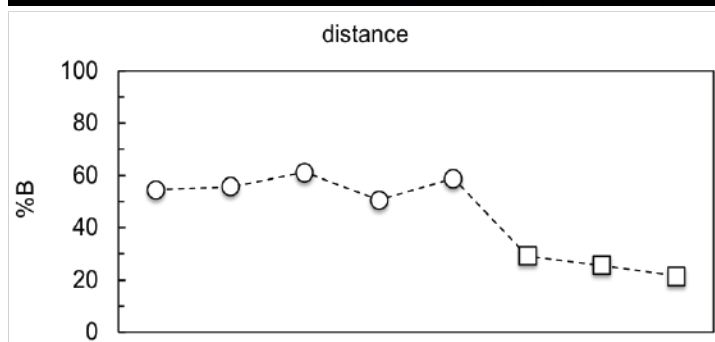
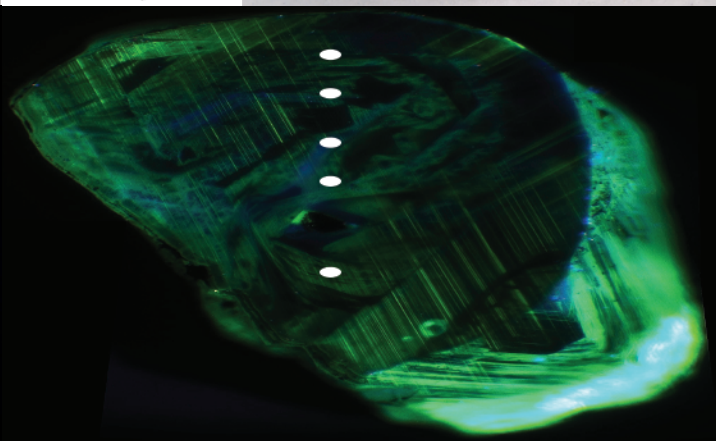
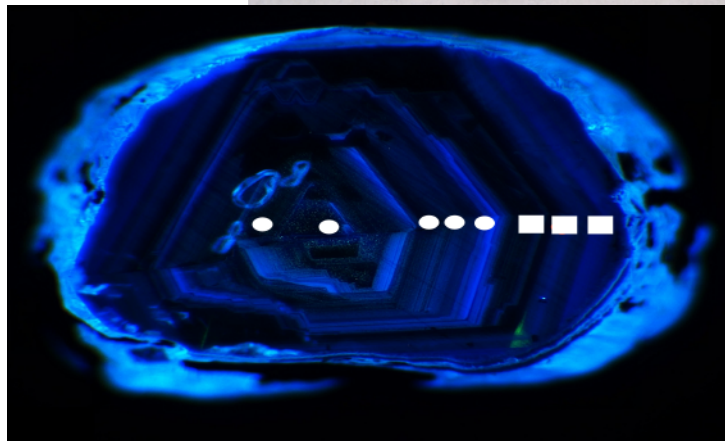
JW062
group: D
aperture: 75 μm



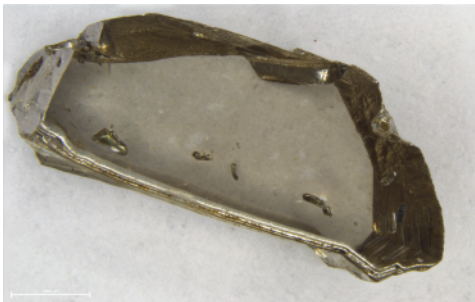
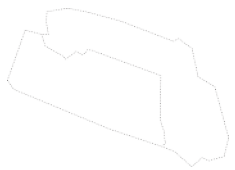
JW068
group: C1
aperture: 100µm



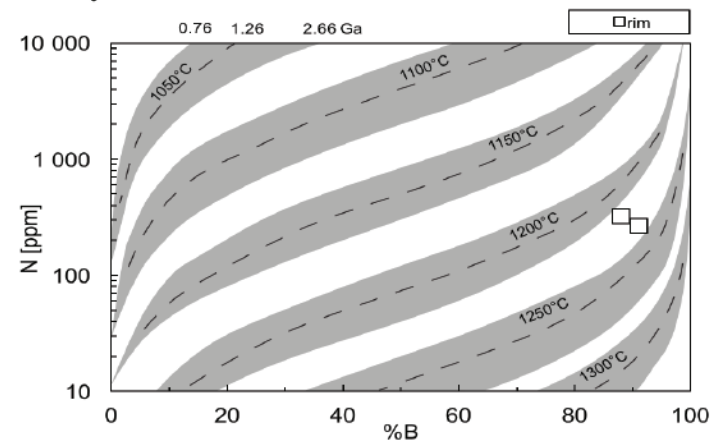
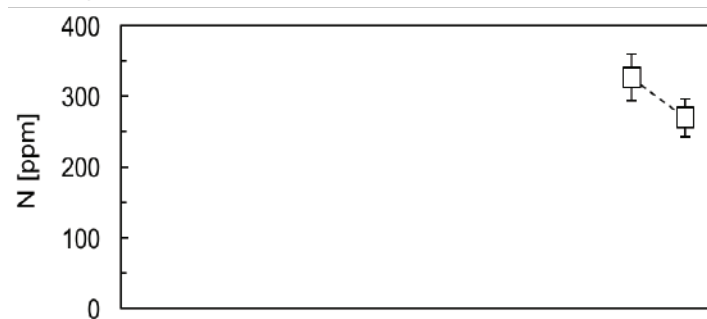
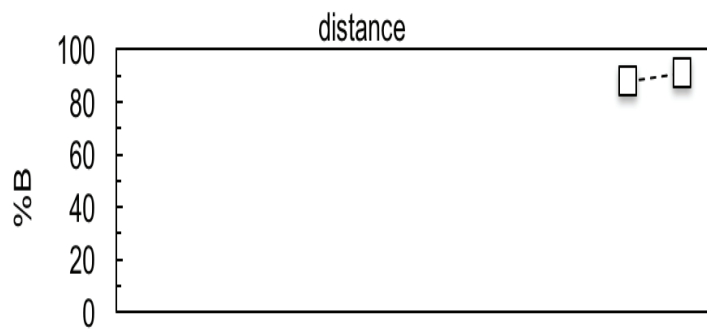
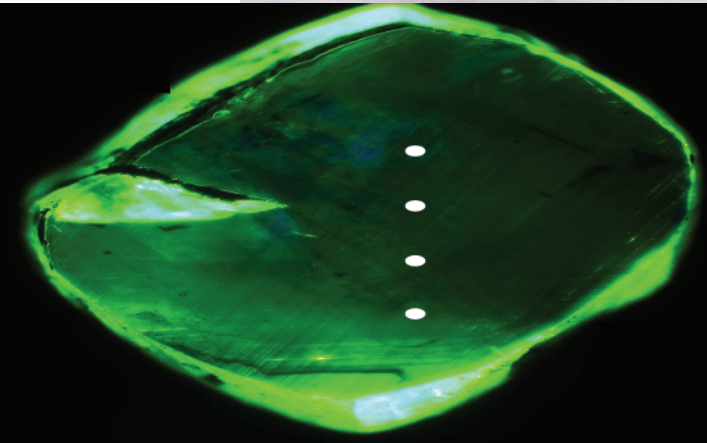
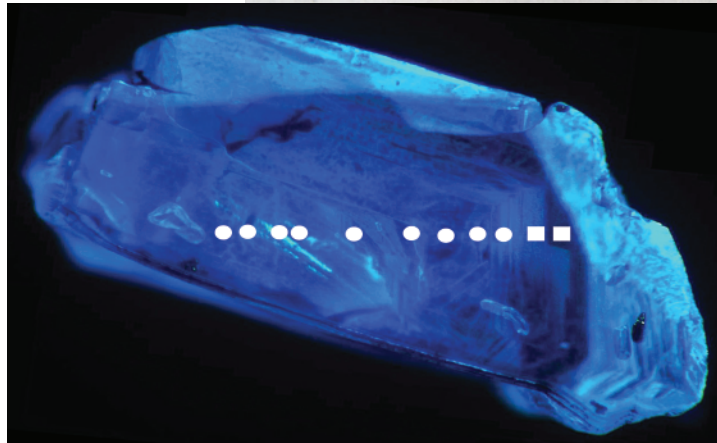
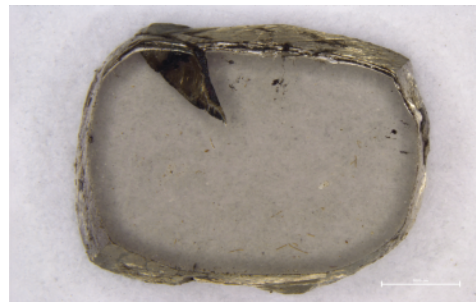
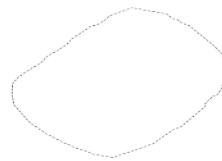
JW070
group: A
aperture: 65µm



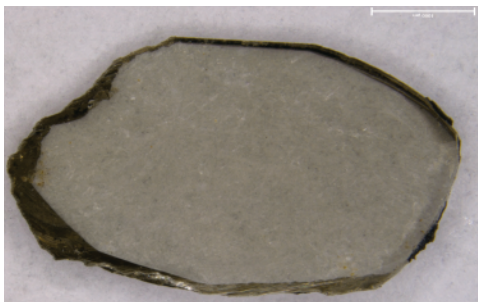
JW073
group: C1
aperture: 75 μ m



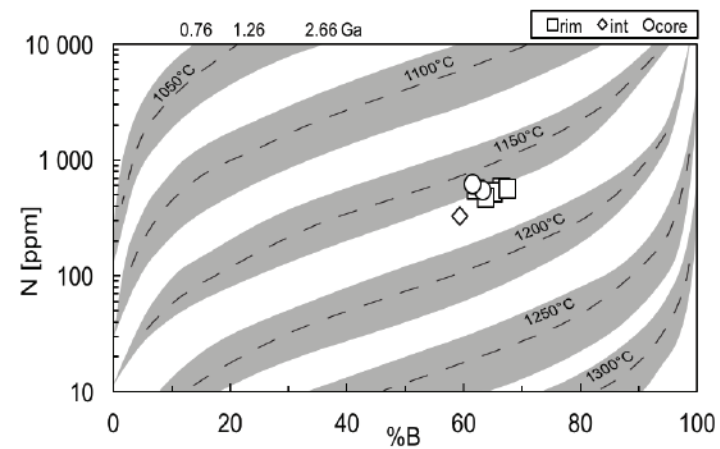
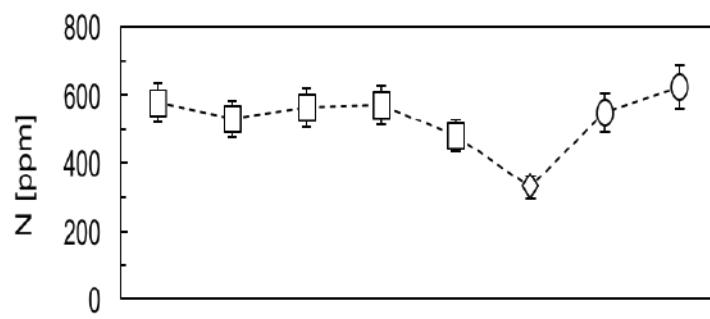
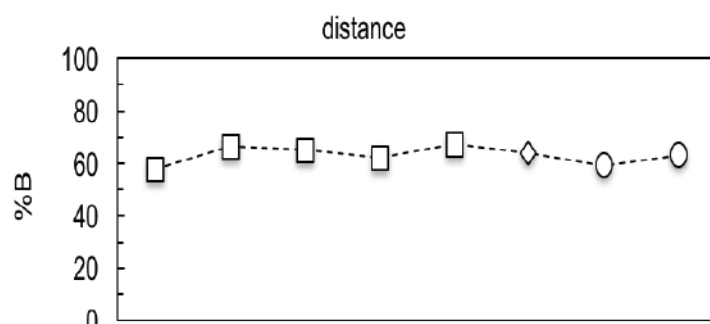
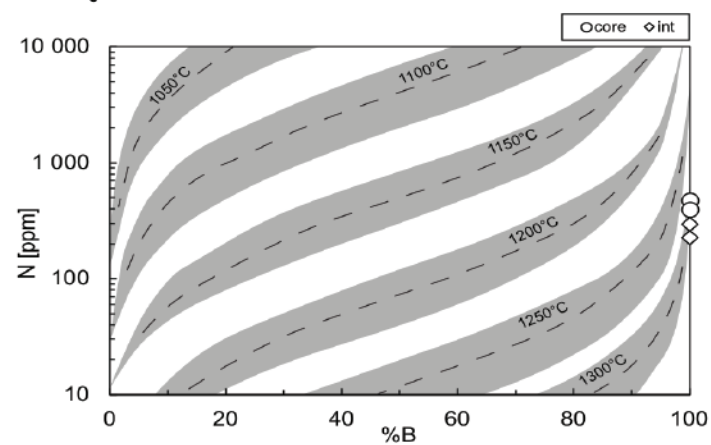
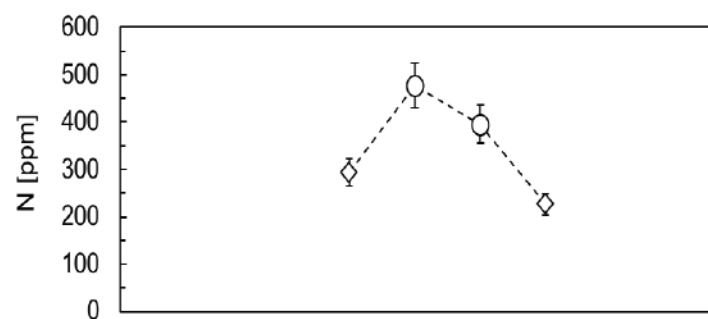
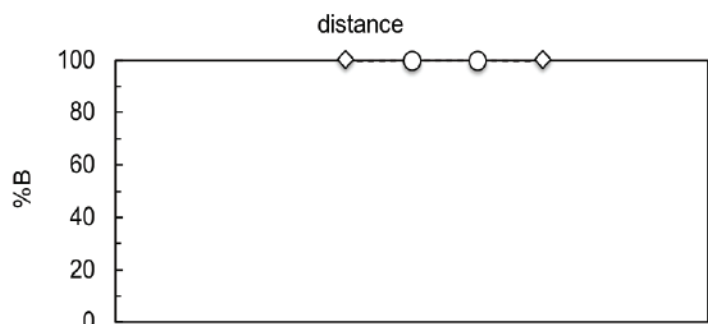
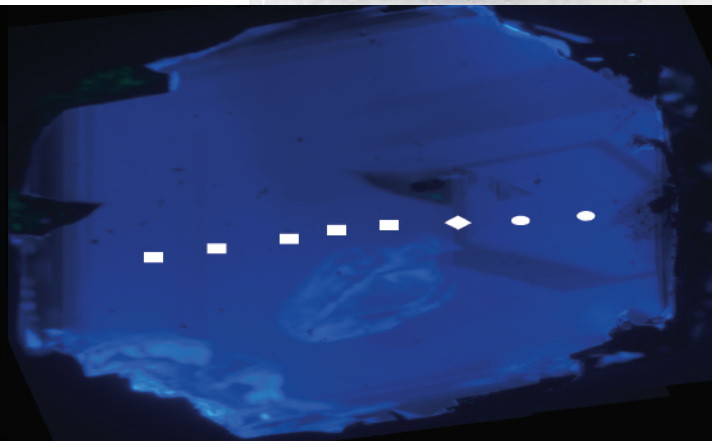
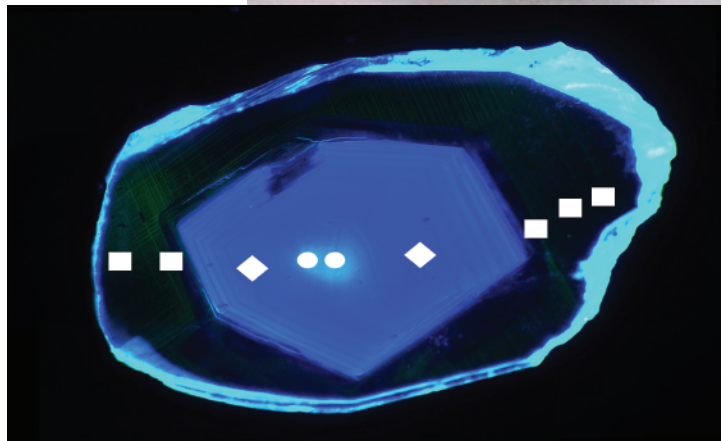
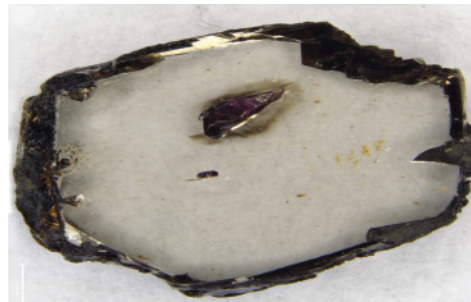
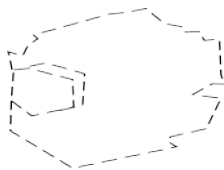
JW080
group: A
aperture: 50 μ m



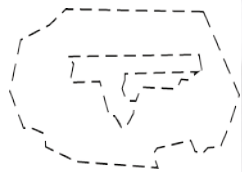
JW082
group: A
aperture: 65 μ m



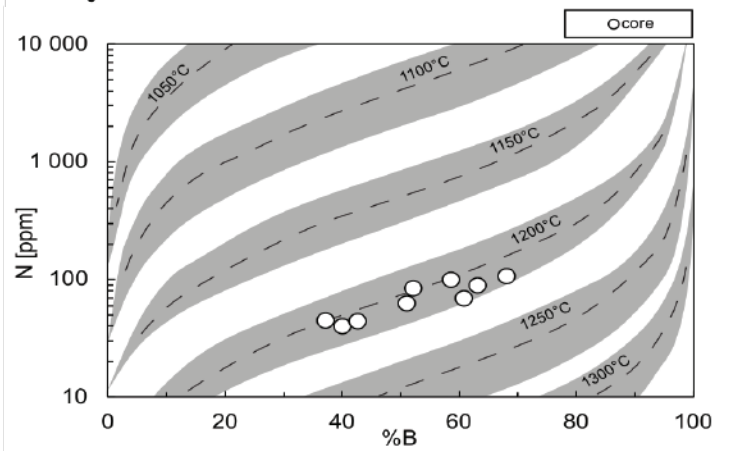
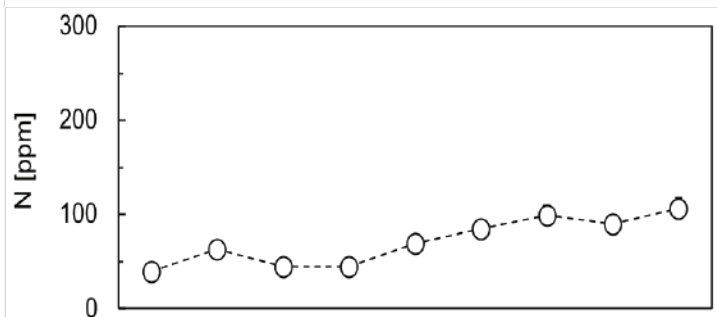
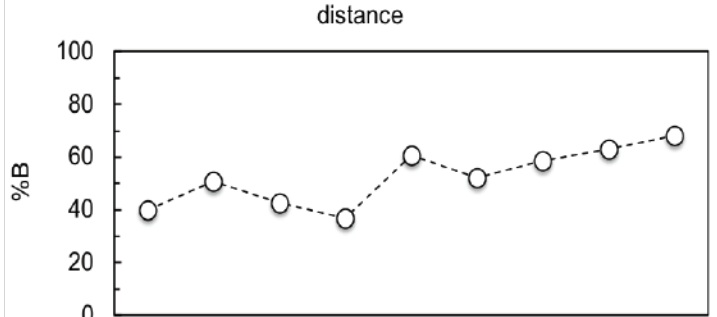
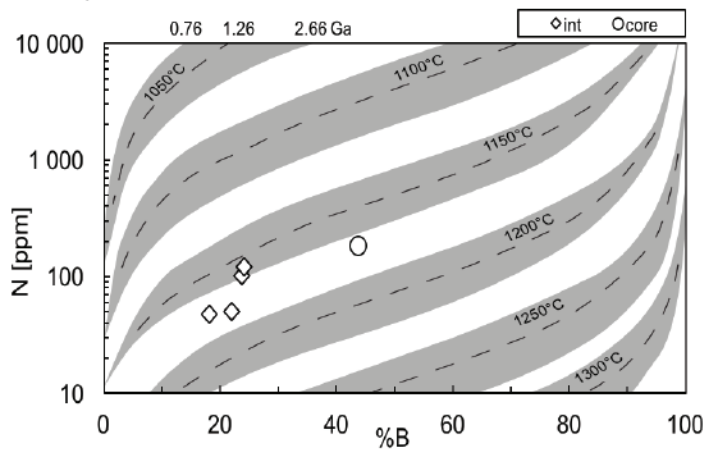
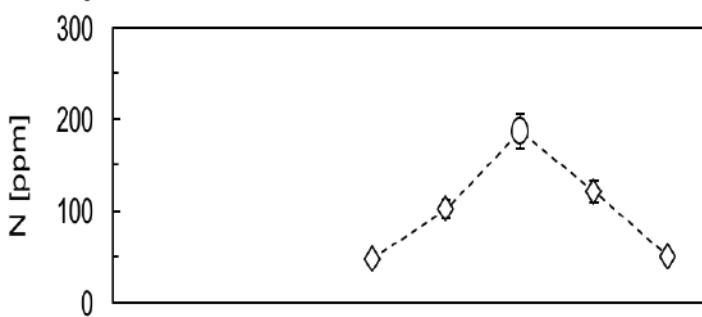
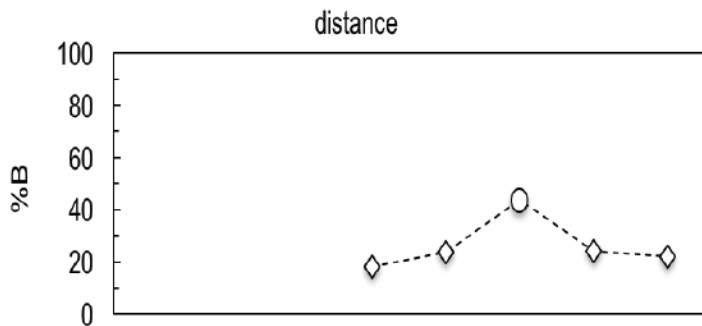
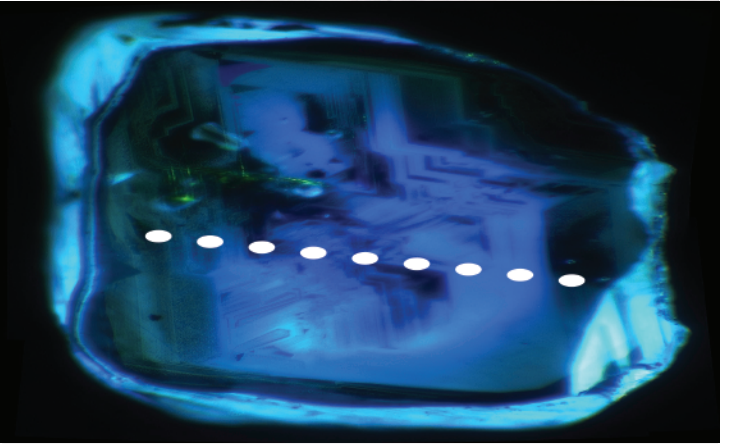
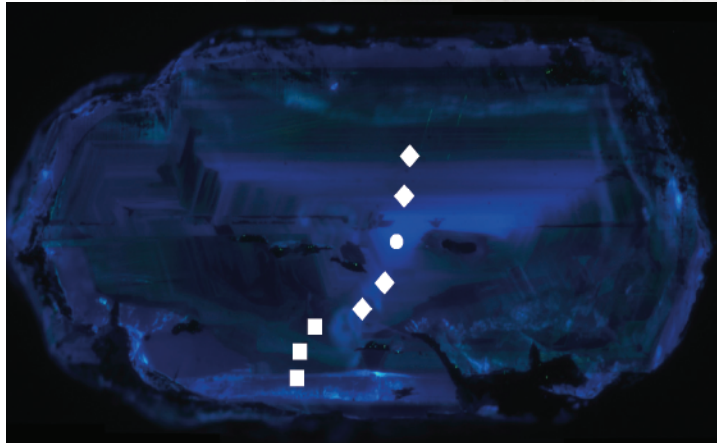
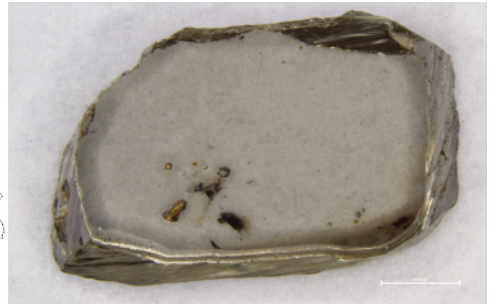
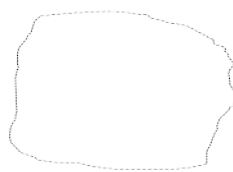
JW083
group: C3
aperture: 75 μ m



JW089
group: C2
aperture: 75 μm



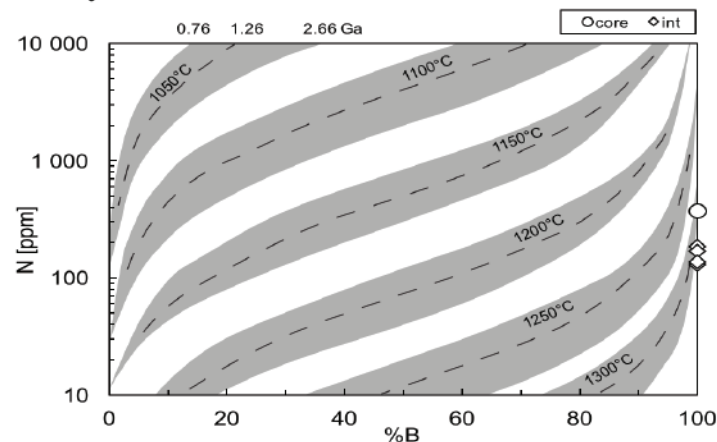
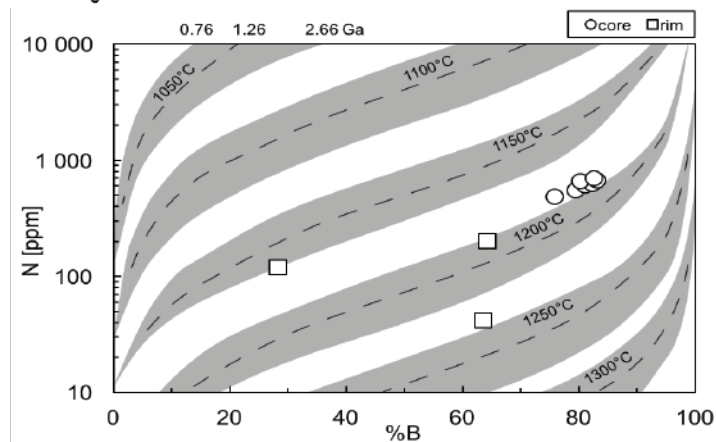
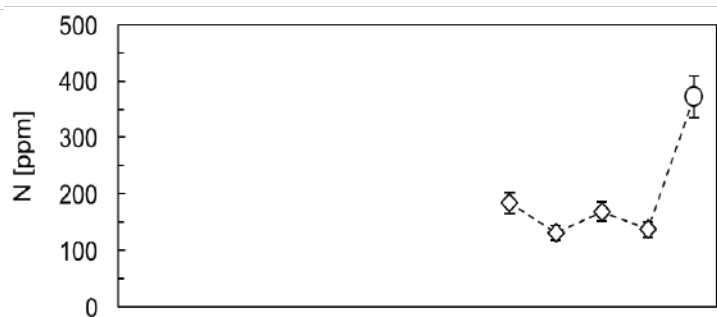
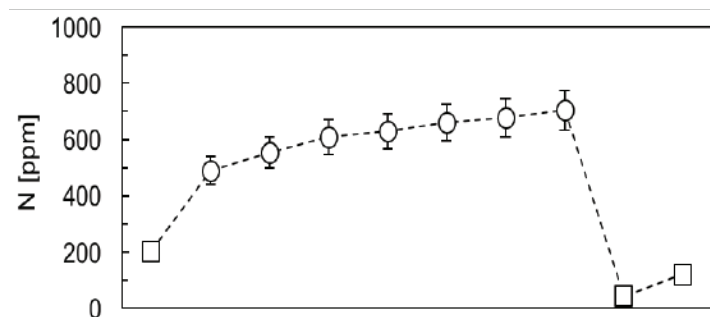
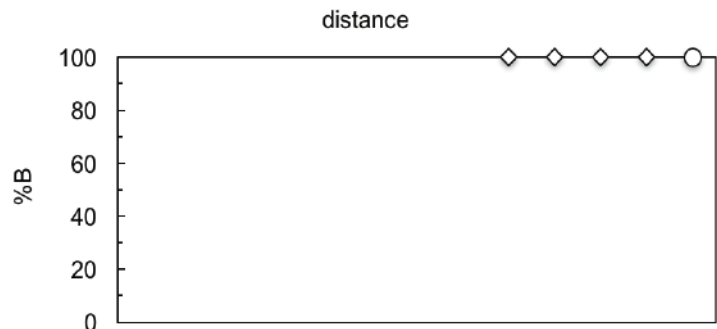
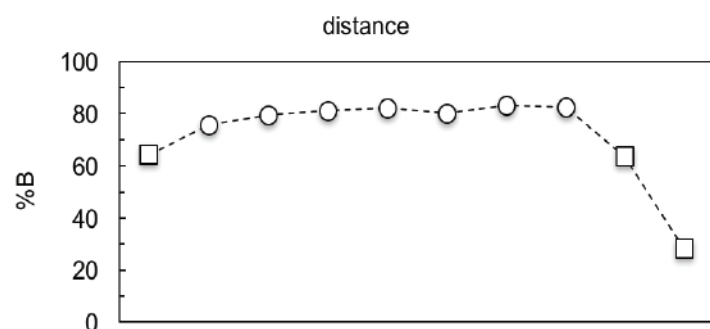
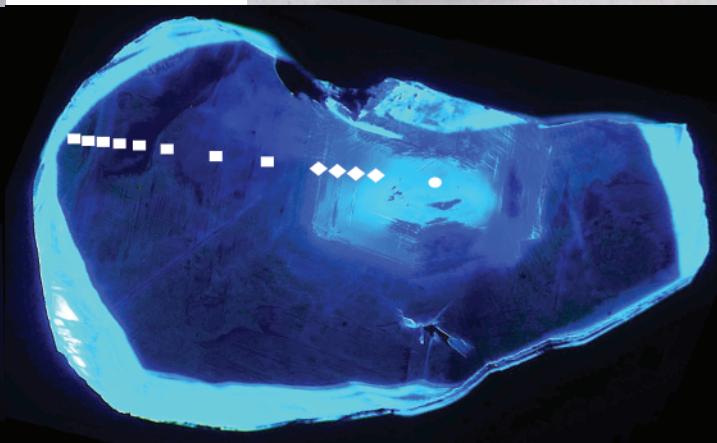
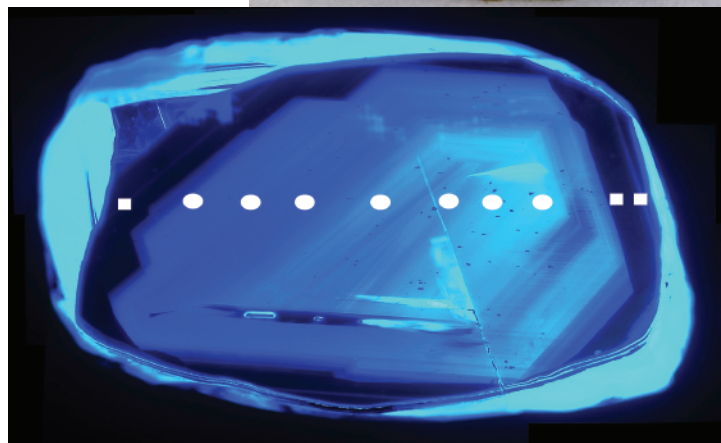
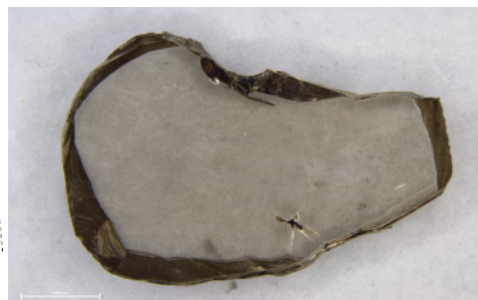
JW094
group: D
aperture: 70 μm



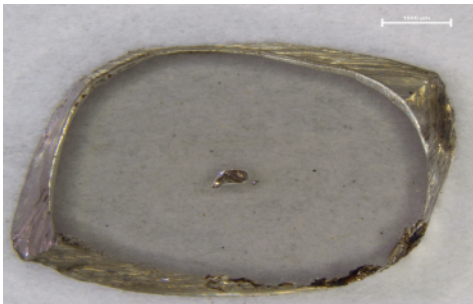
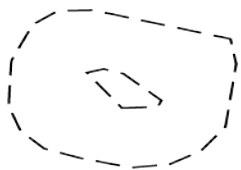
JW098
group: C2
aperture: 60μm



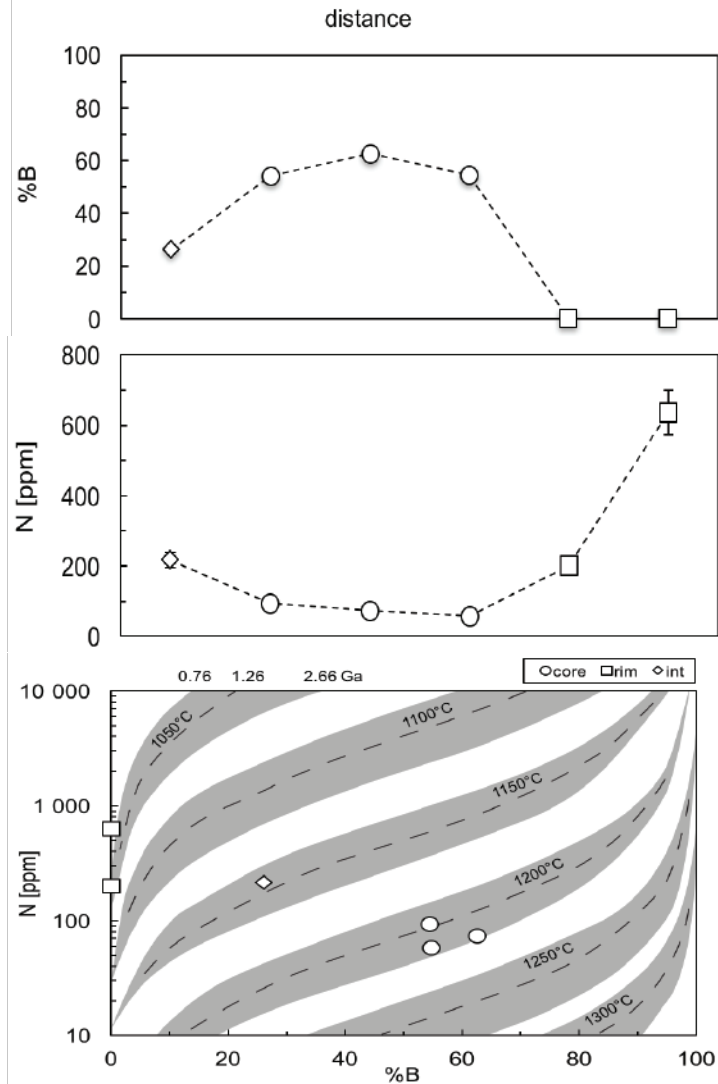
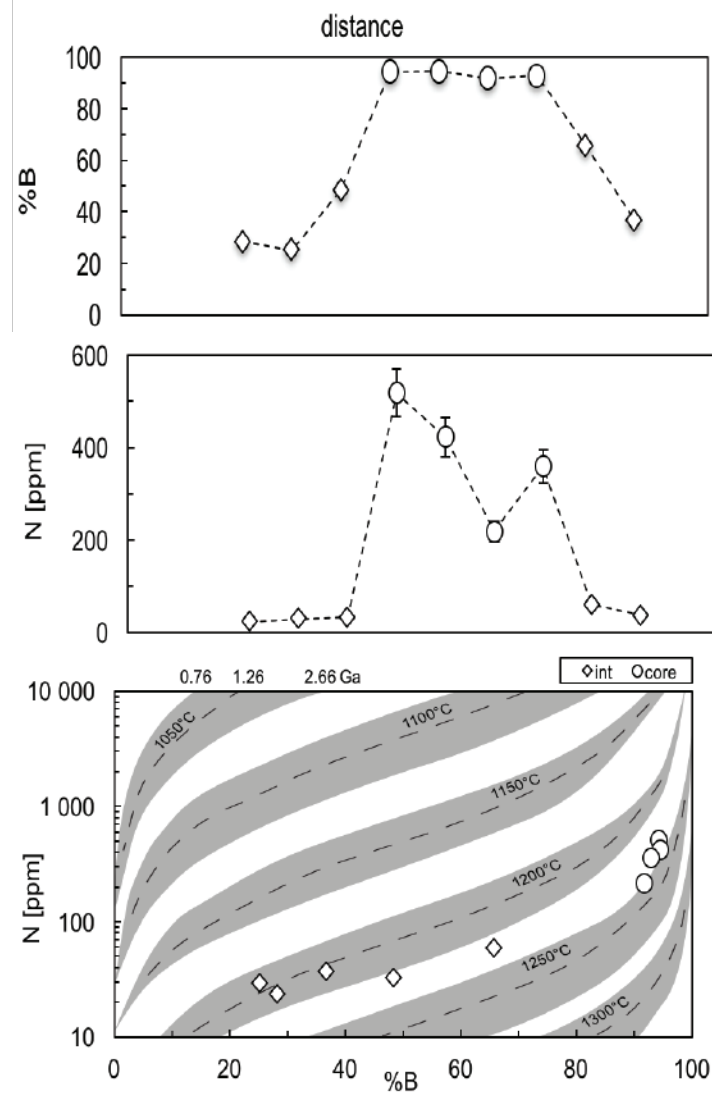
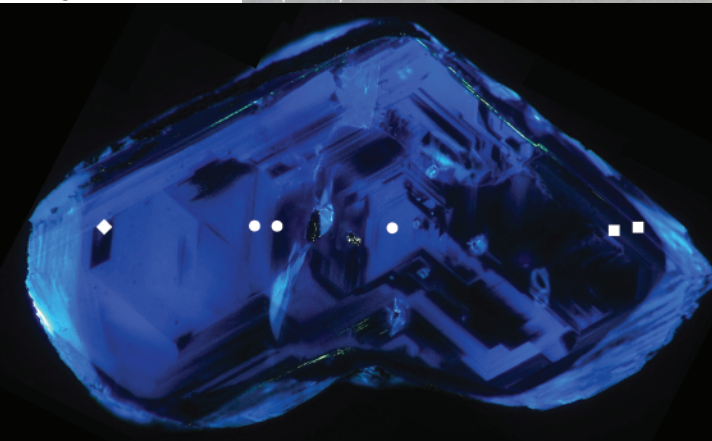
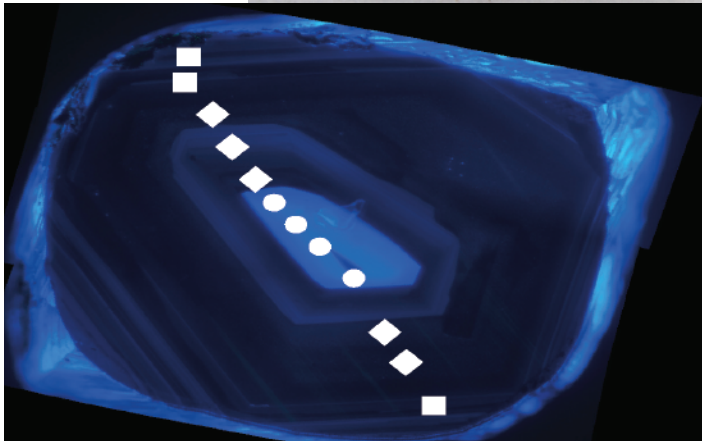
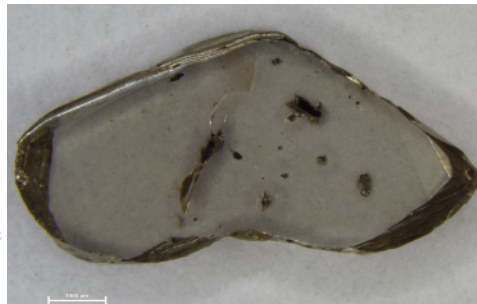
JW101
group: C2
aperture: 50μm



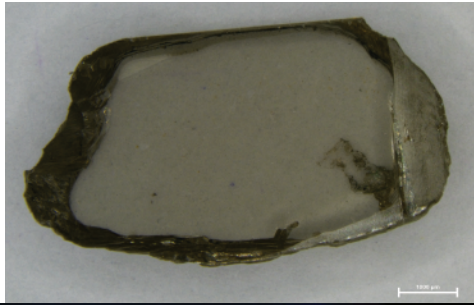
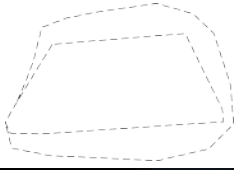
JW102
group: C2
aperture: 75 μ m



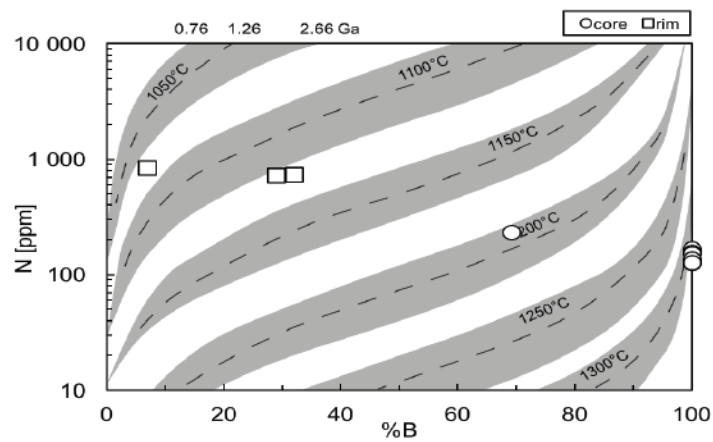
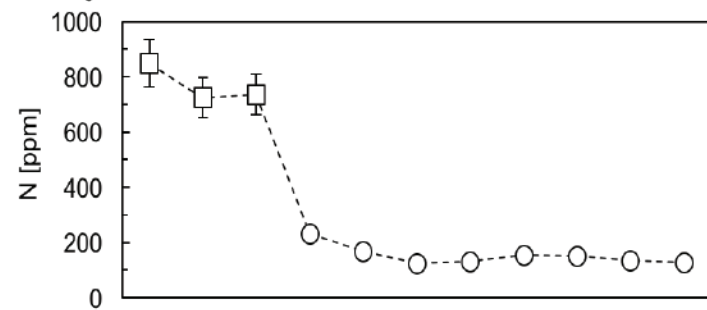
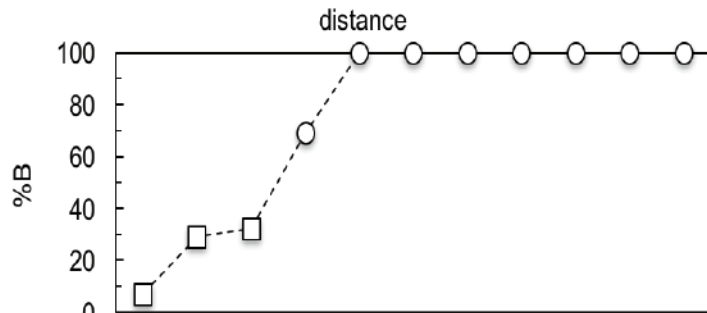
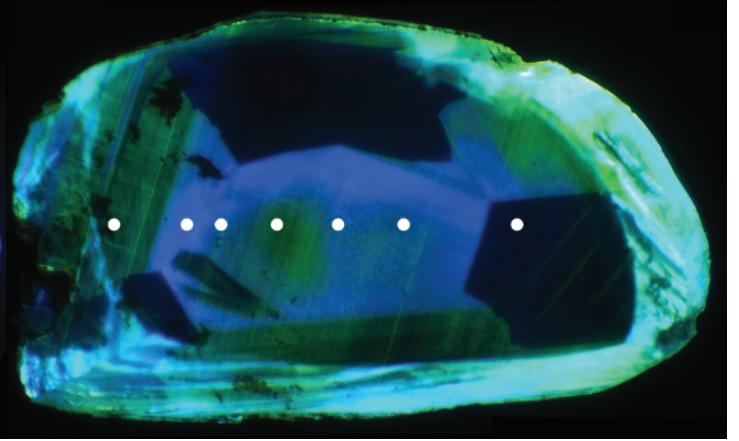
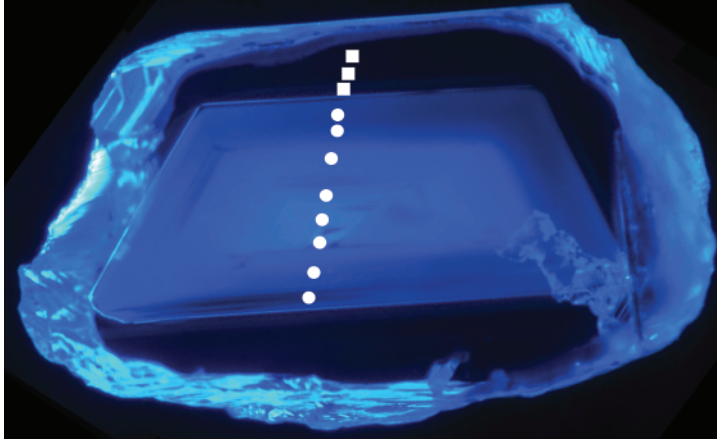
JW109
group: C1
aperture: 70 μ m



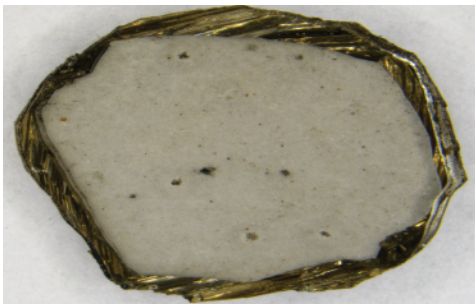
JW111
group: C1
aperture: 50μm



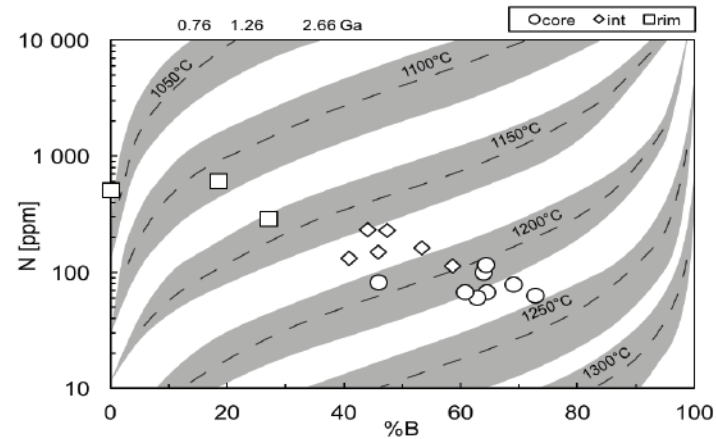
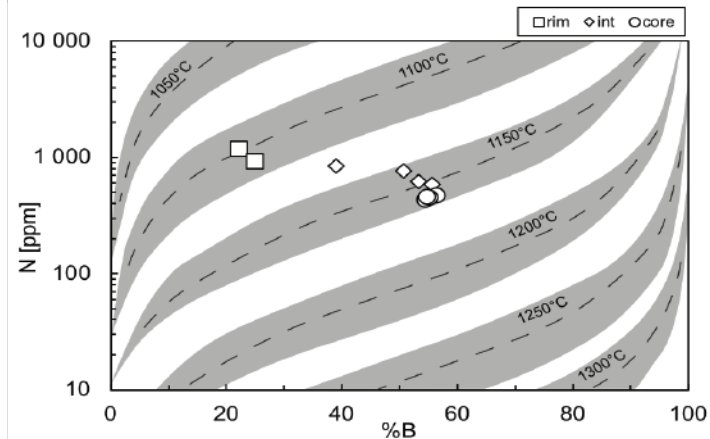
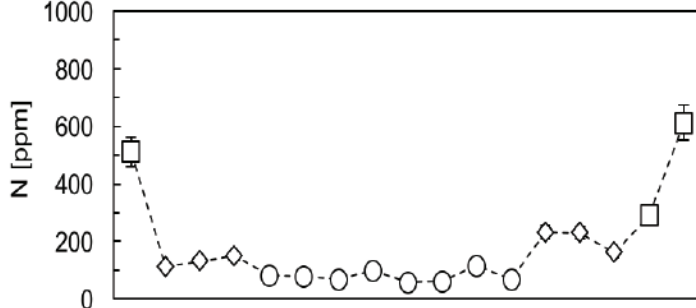
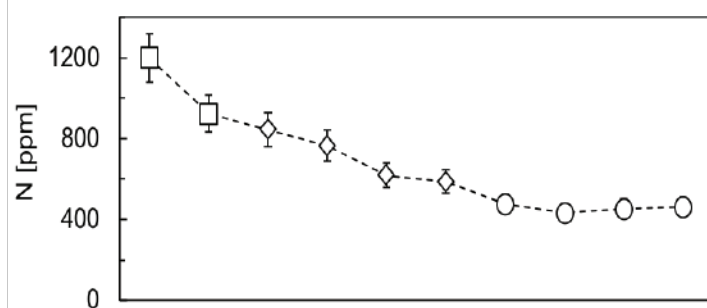
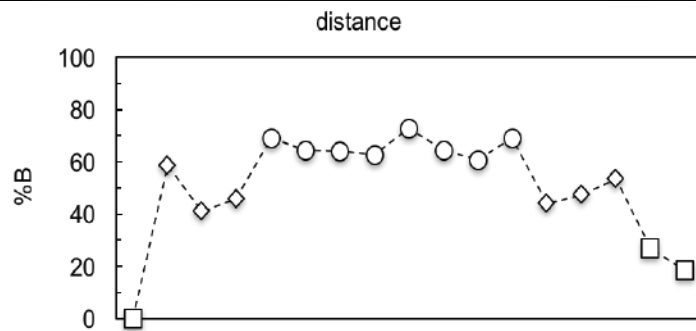
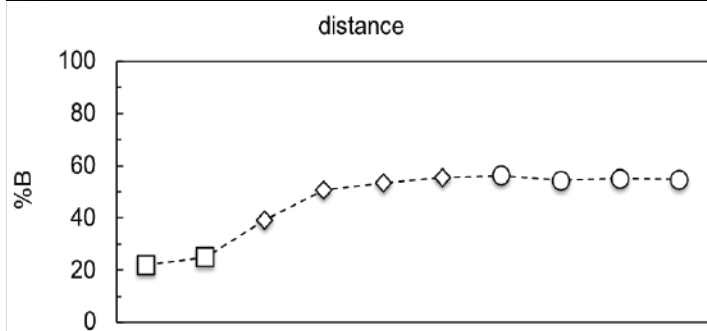
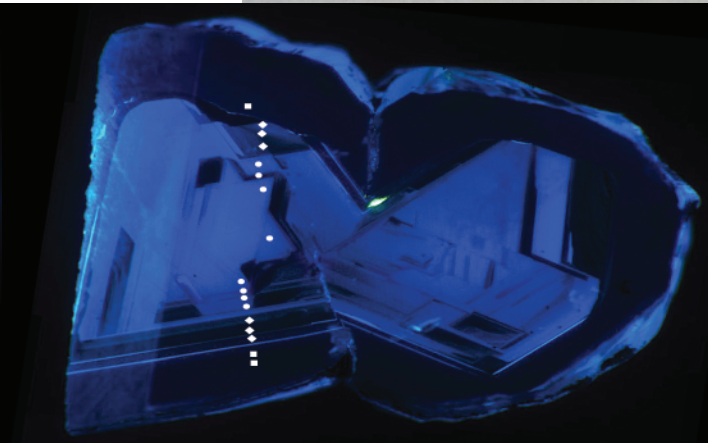
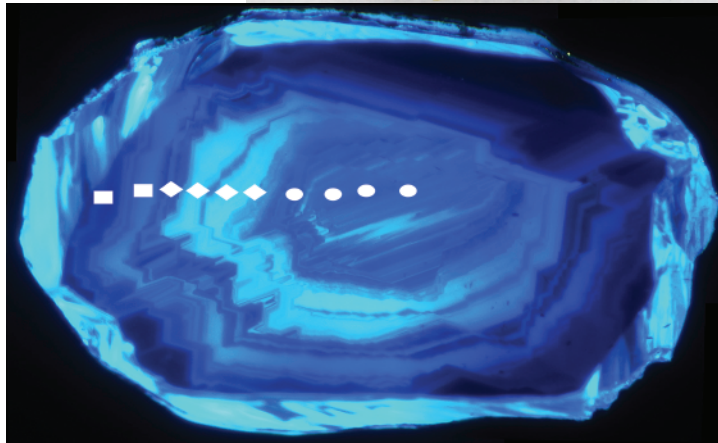
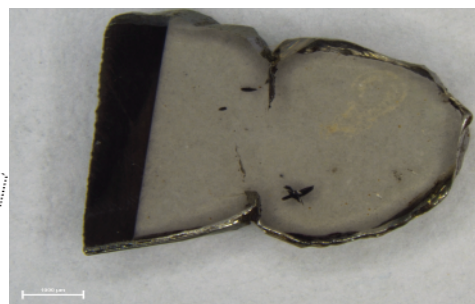
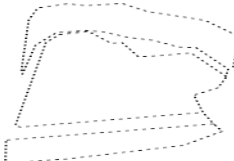
JW112
group: A
aperture: 60μm



JW114
group: C1
aperture: 75µm



JW115
group: C1
aperture: 75µm



SAMPLE

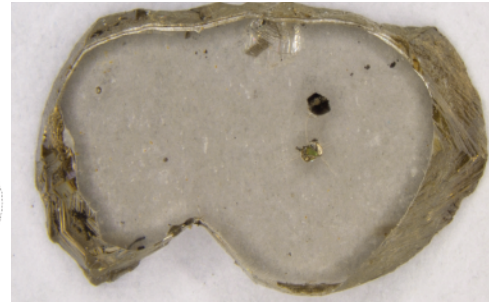
group:
aperture in μm

Growth zonation
sketch inferred
from FTIR data

Transmitted light image
of the diamond plate

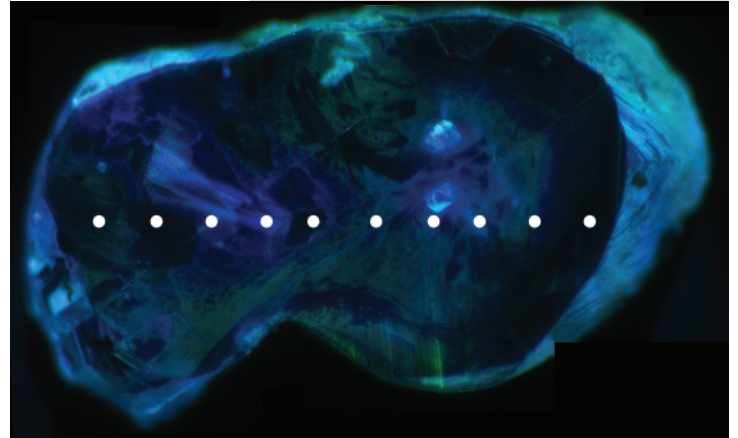
JW116B

group: A
aperture: $60\mu\text{m}$



Cathodoluminescence image
of the diamond plate

Markers represent individual
spots in major growth zones of
core (circle), intermediate
(diamond) and rim (square)



Nitrogen aggregation in %B of individual
spots on the diamond plate.

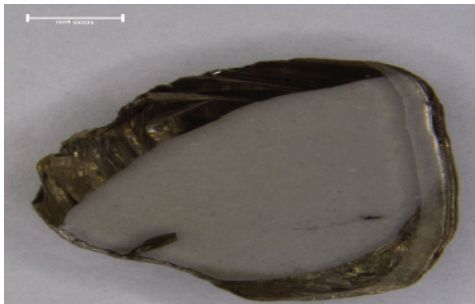
Markers that are only plotted in the CL
image but not in the graphs are below
detection limit (< 20 at. ppm N; Type IIa).

Nitrogen content in atomic ppm (ppm)
of individual spots on the diamond
plate

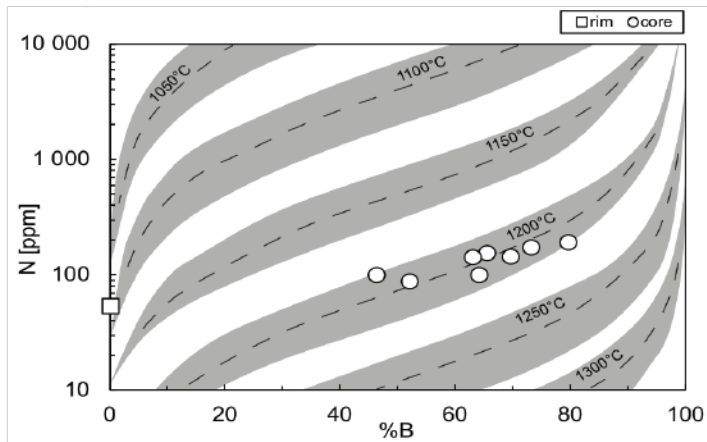
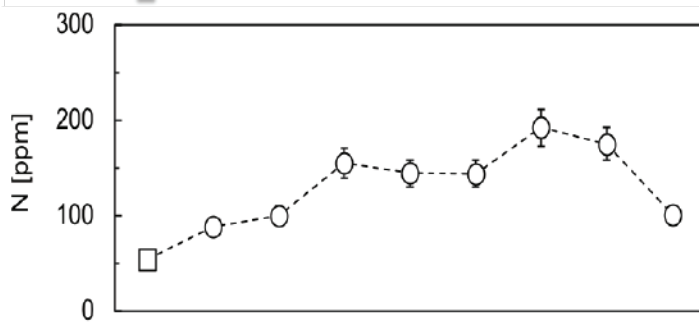
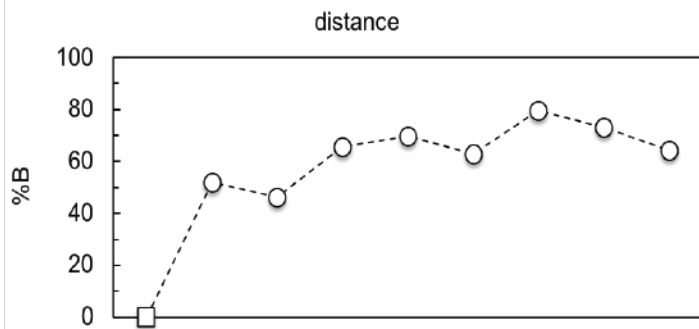
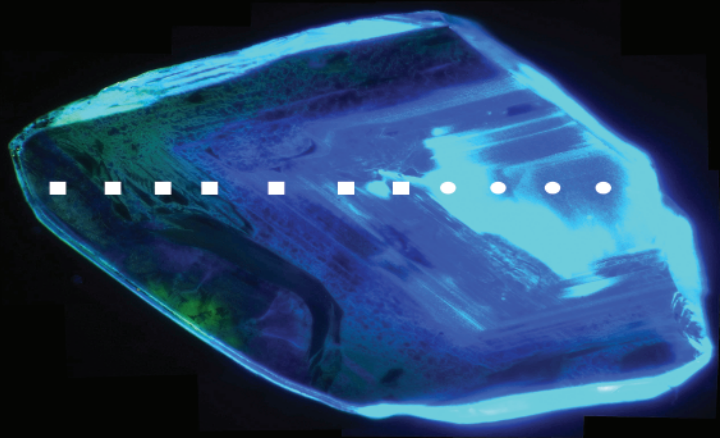
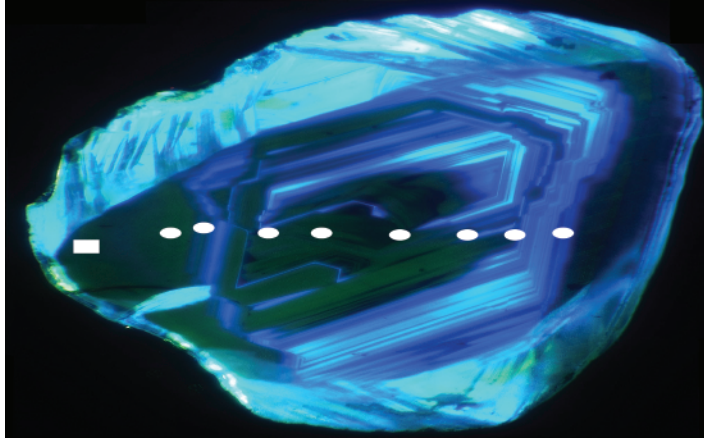
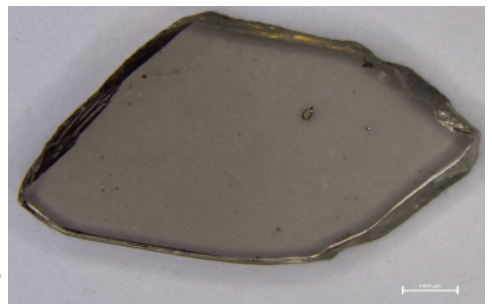
Nitrogen content vs aggregation of
individual spots on the diamond plate.

Isotherms at 0.76 (left grey border of
dashed lines), 1.26 (dashed lines)
and 2.66 (right grey border of dashed
lines) Ga are calculated for inferred
diamond formation ages from litera-
ture at 1.0, 1.5 and 2.9 Ga and are
corrected for the 240 Ma emplace-
ment age of the Jwaneng kimberlites.

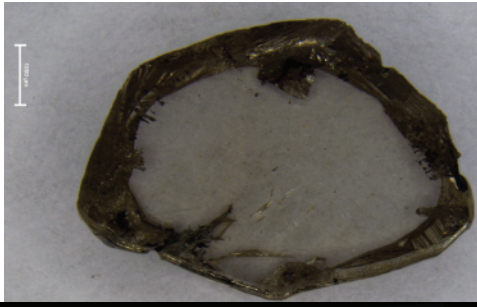
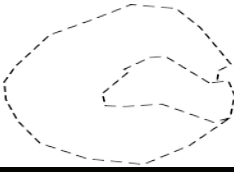
JW122
group: C2
aperture: 75µm



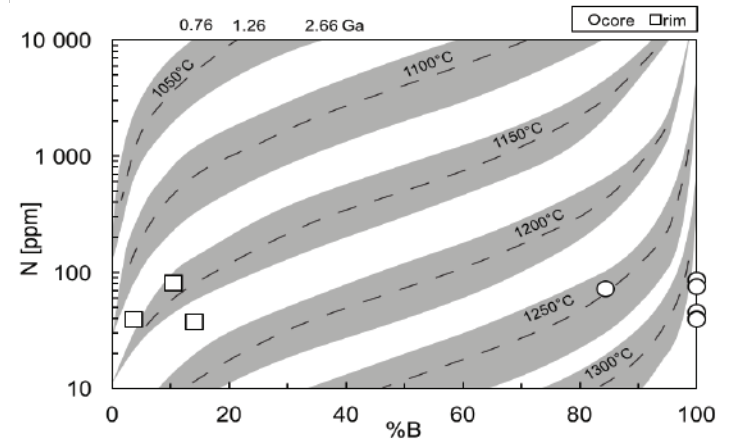
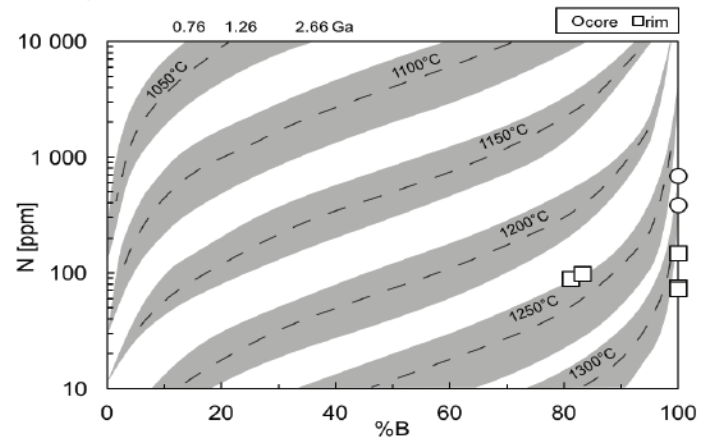
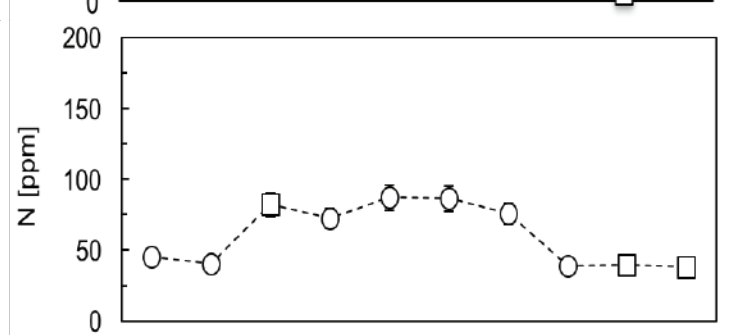
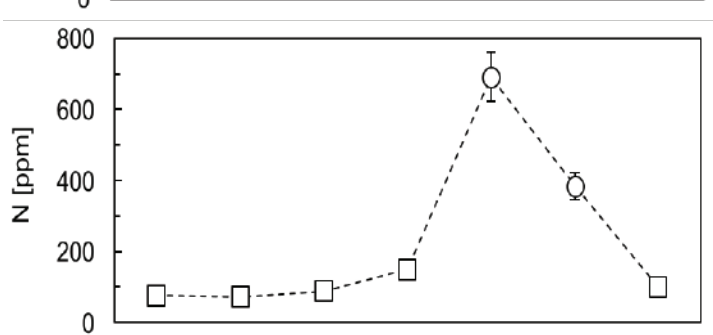
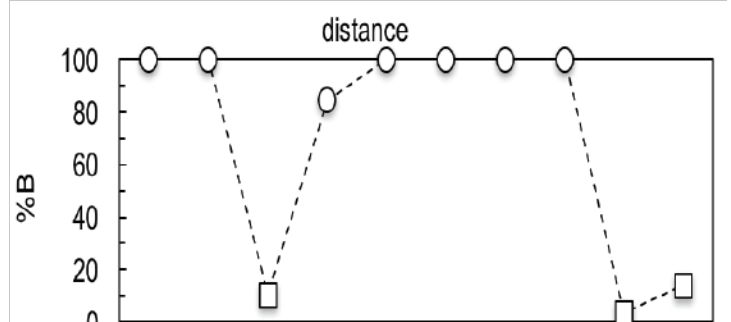
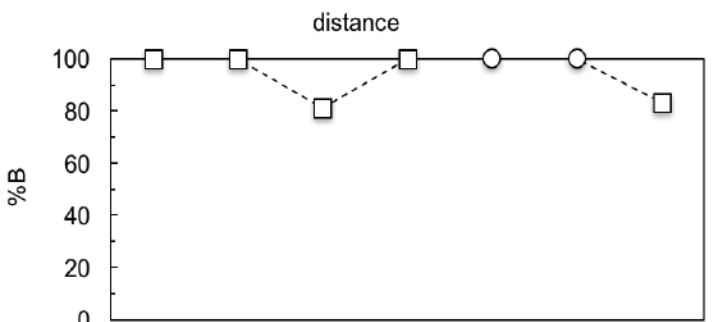
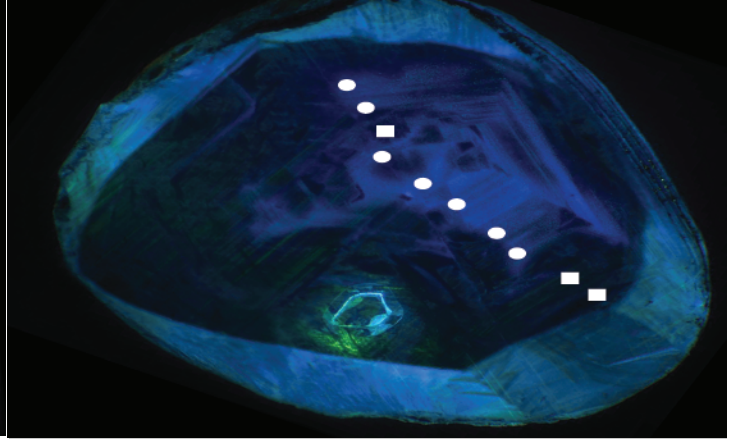
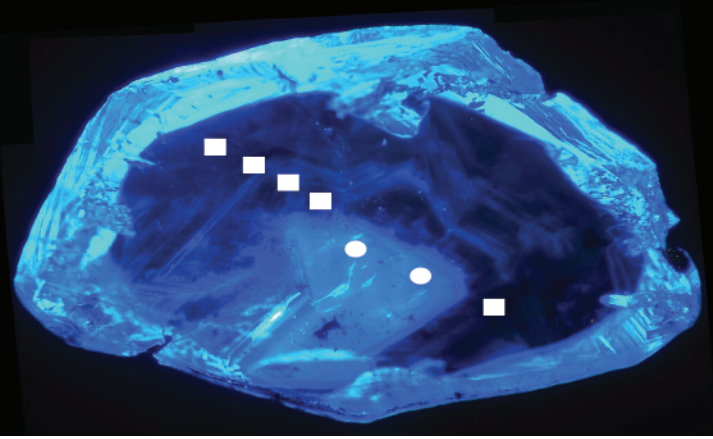
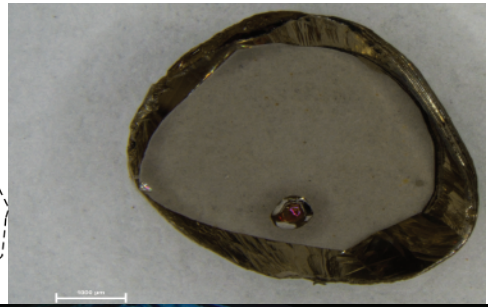
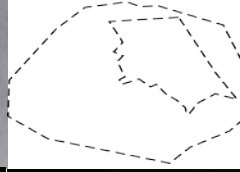
JW124
group: A
aperture: 75µm



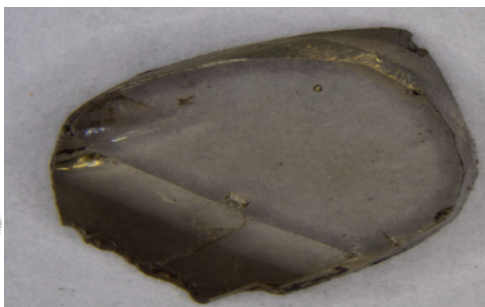
JW129
group: C2
aperture: 50 μ m



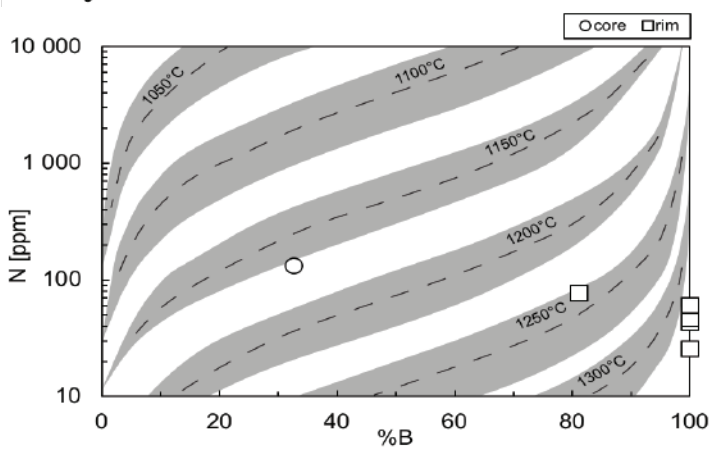
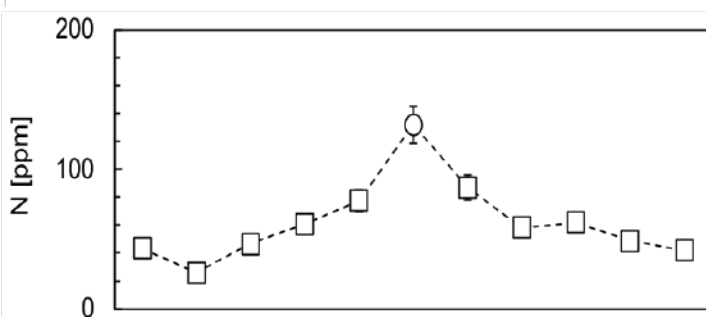
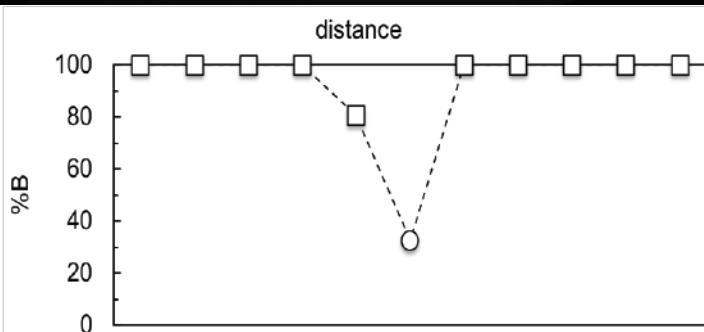
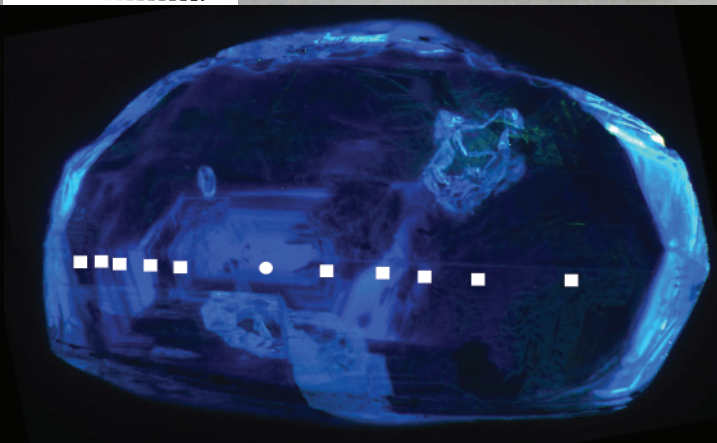
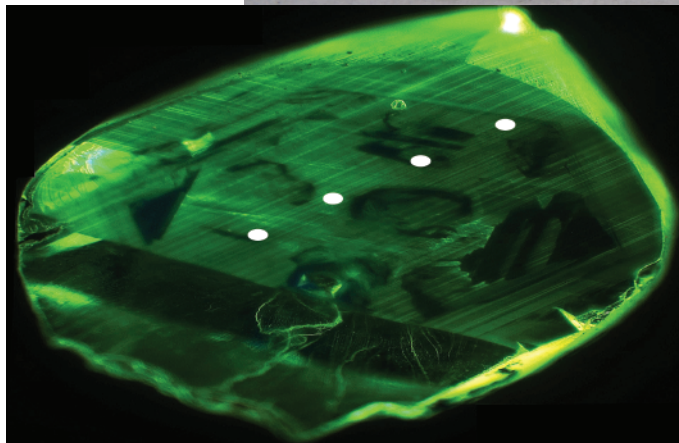
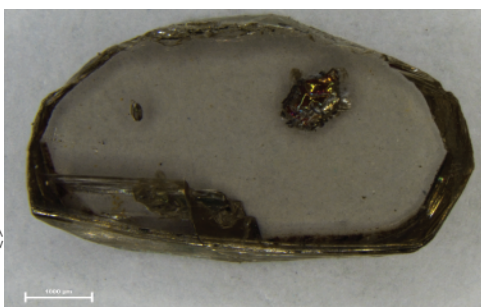
JW131
group: C2
aperture: 60 μ m



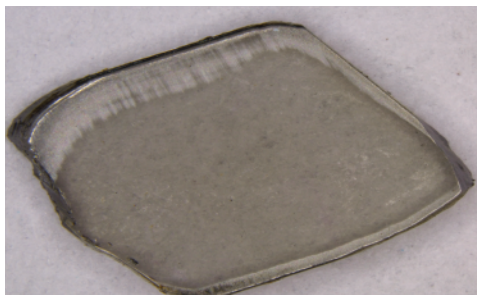
JW136
group: A
aperture: 75μm



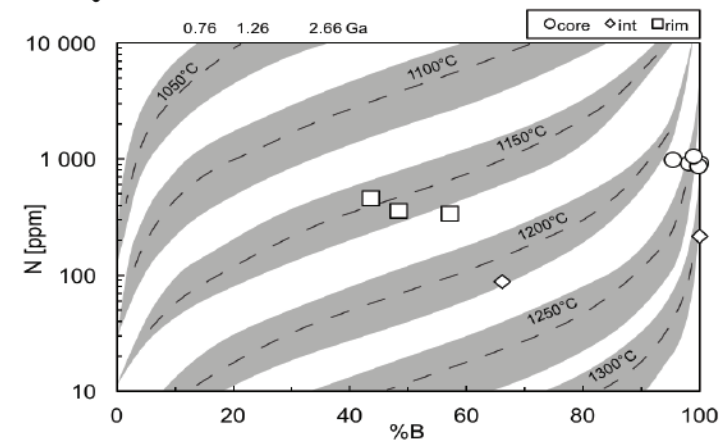
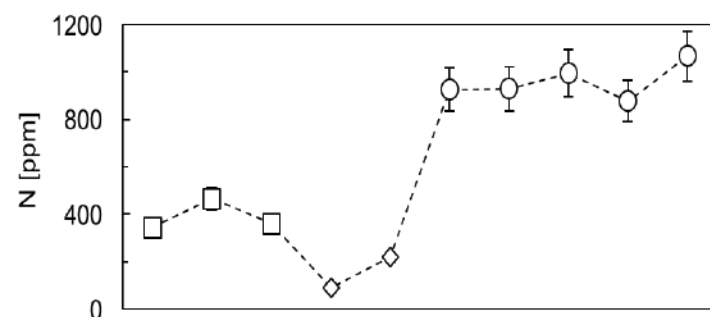
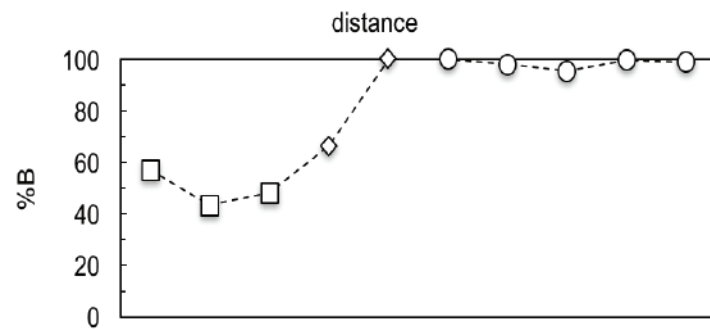
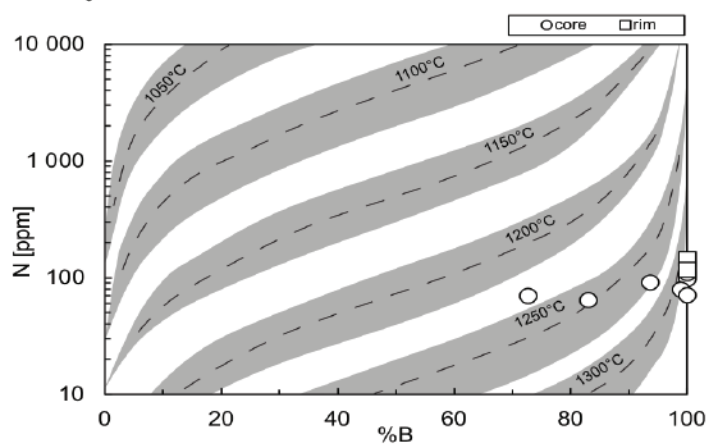
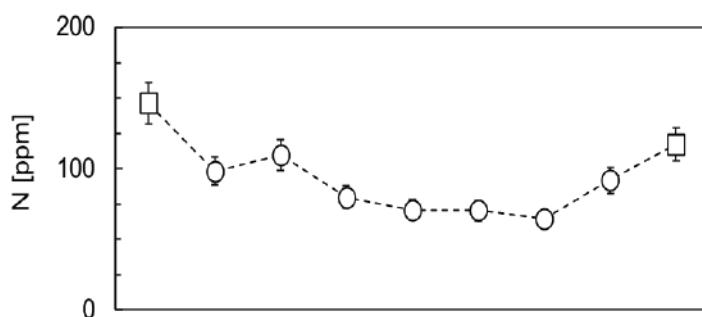
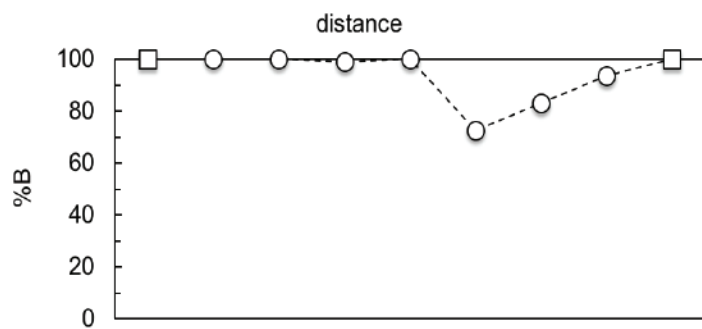
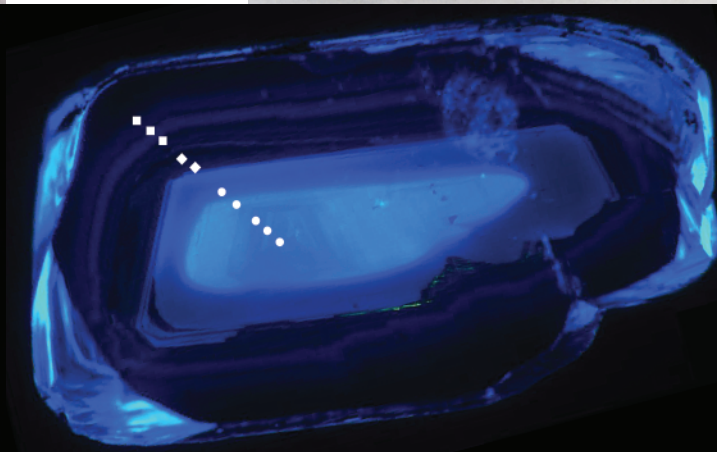
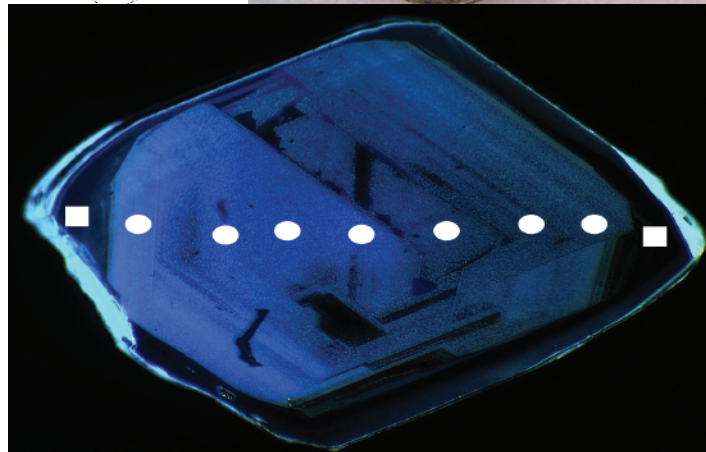
JW137
group: C2
aperture: 60μm



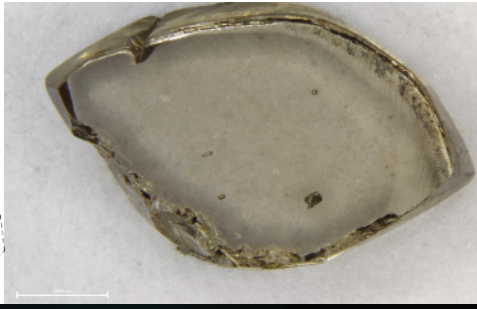
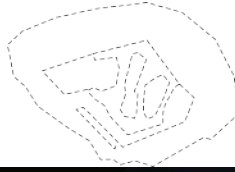
JW138
group: C1
aperture: 100µm



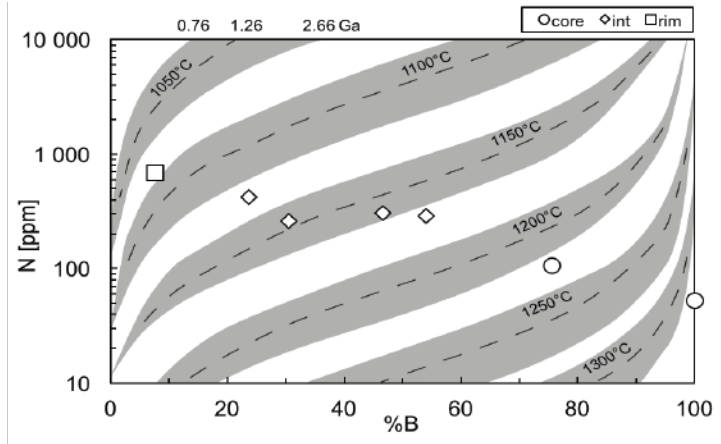
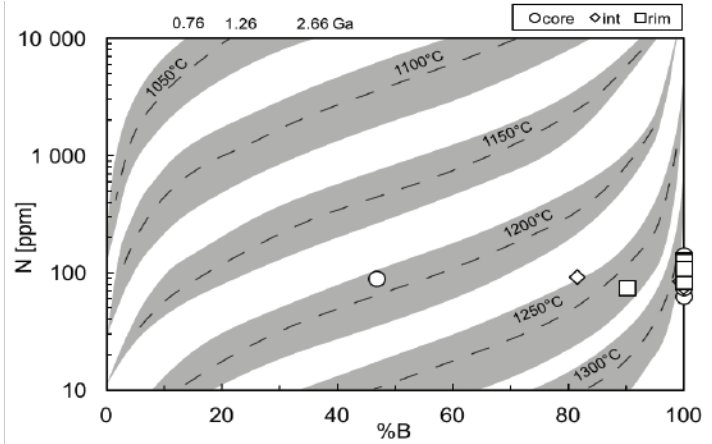
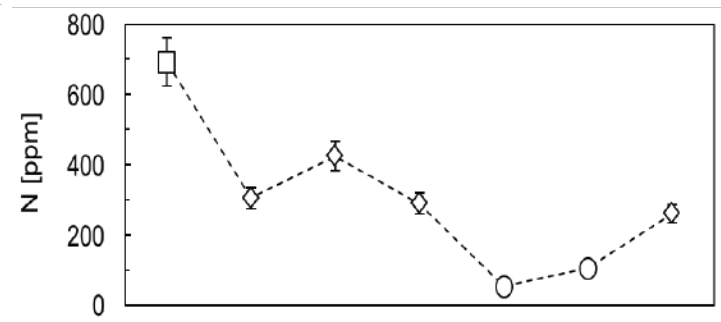
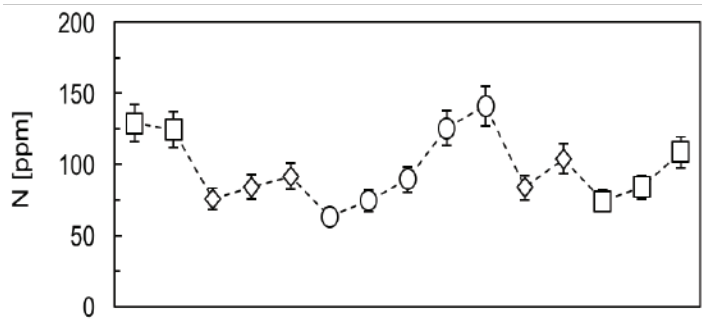
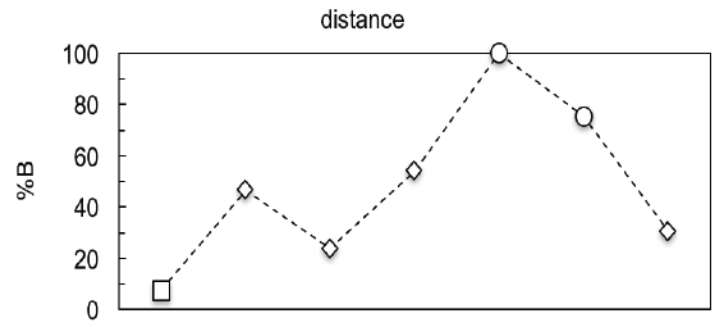
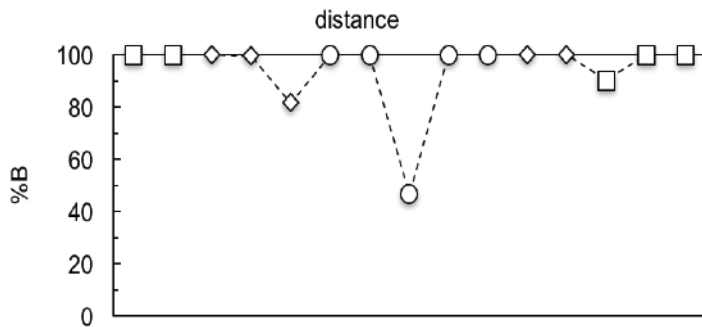
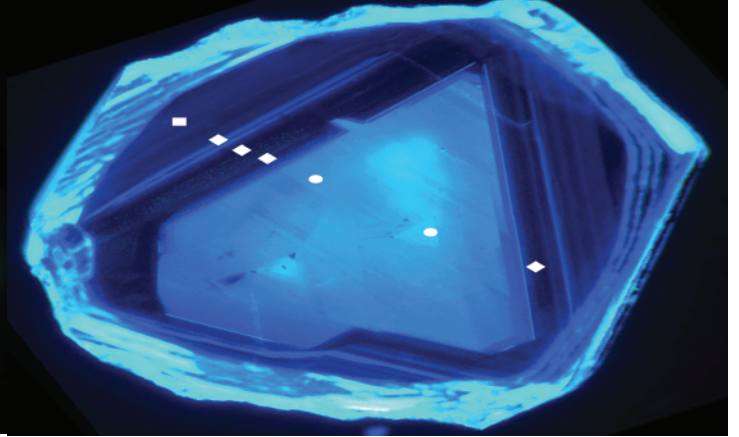
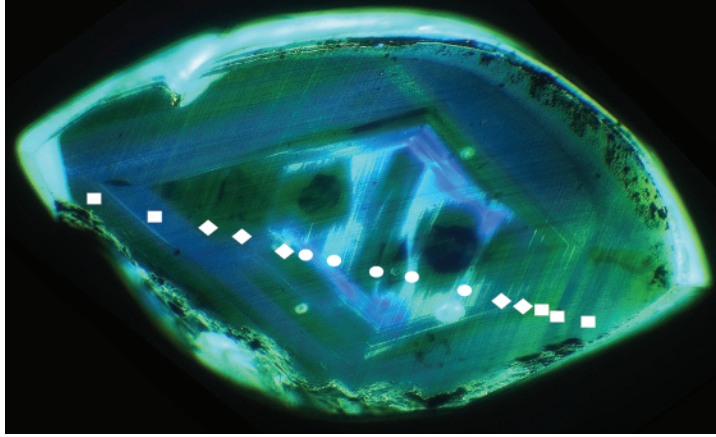
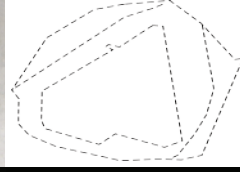
JW141
group: C2
aperture: 60µm



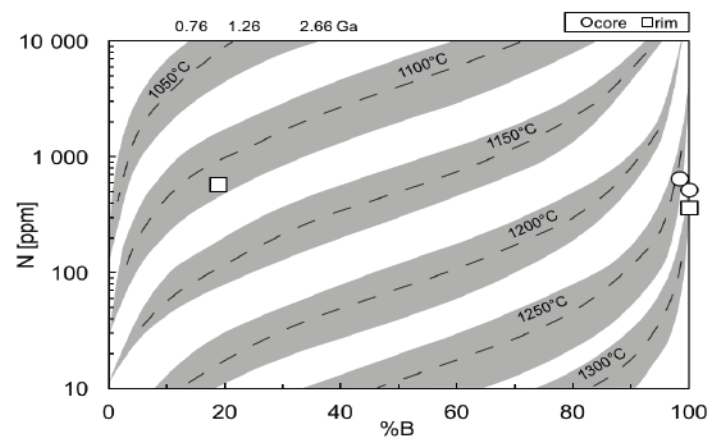
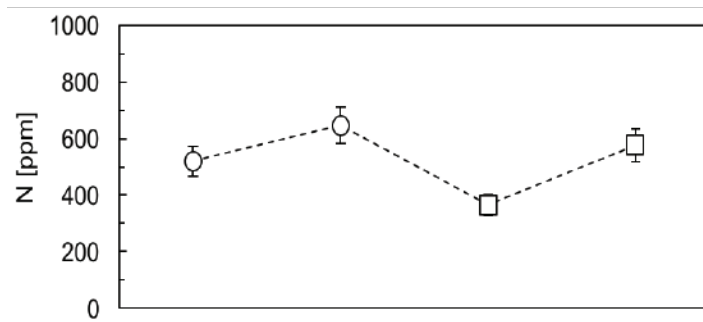
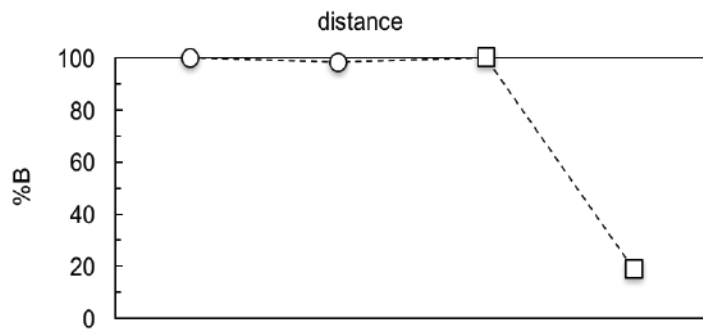
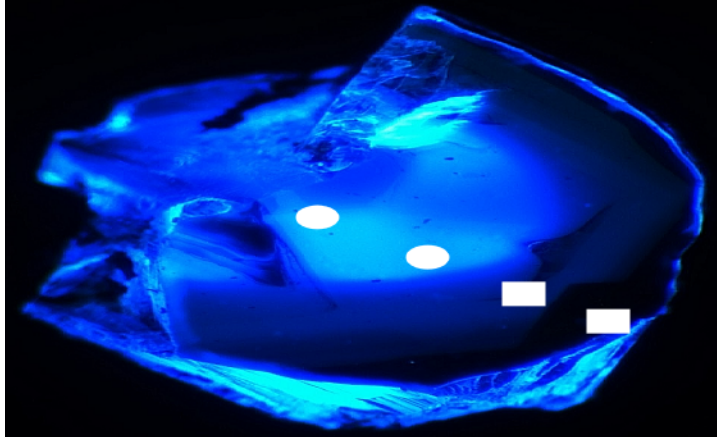
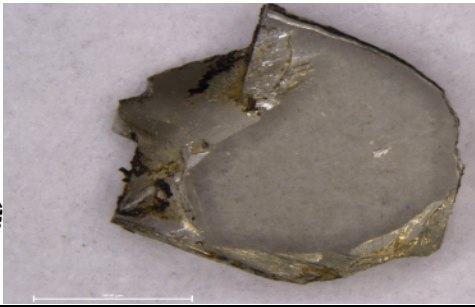
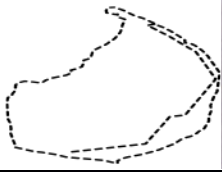
JW144
group: C3
aperture: 50µm



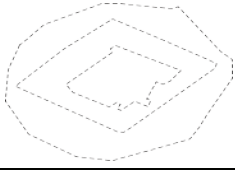
JW147
group: C1
aperture: 50µm



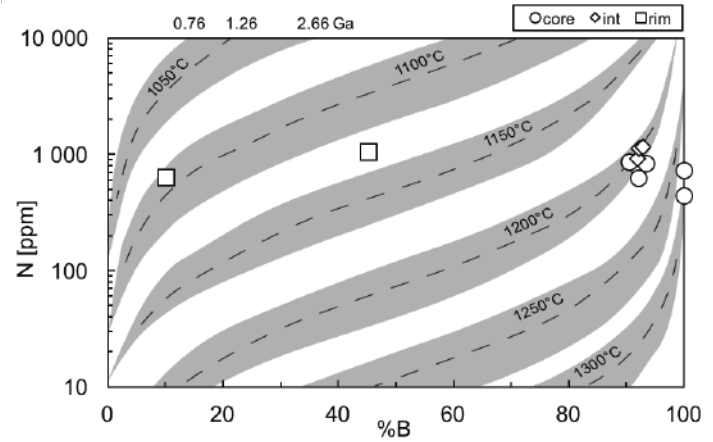
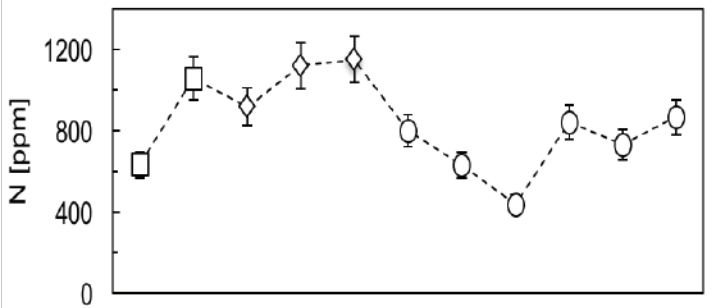
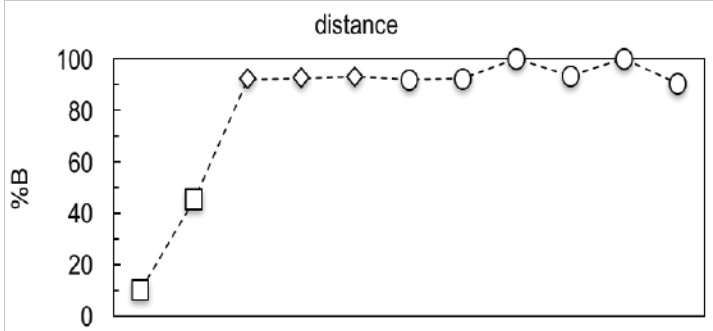
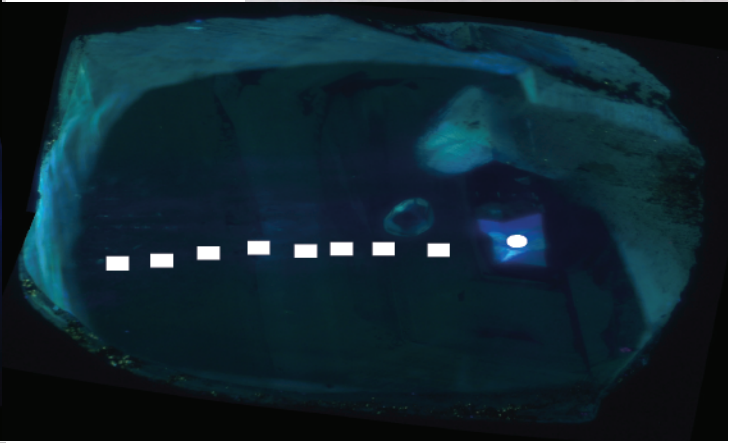
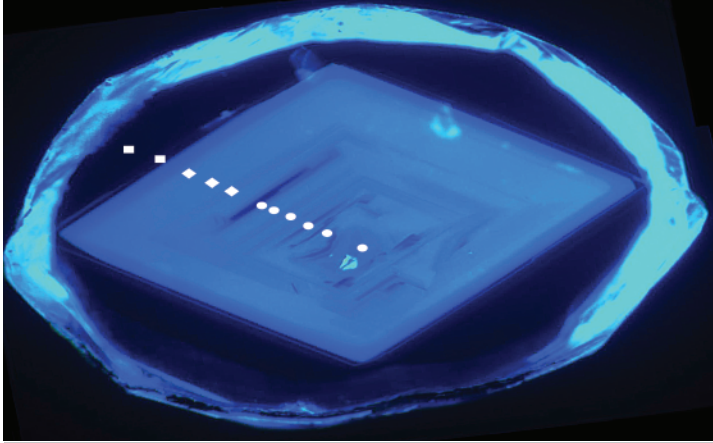
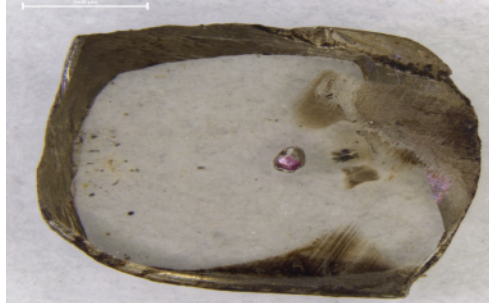
JW166
 group: C1
 aperture: 100 μ m



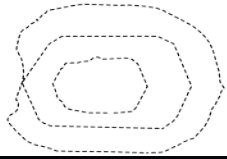
JW175
group: C3
aperture: 50 μ m



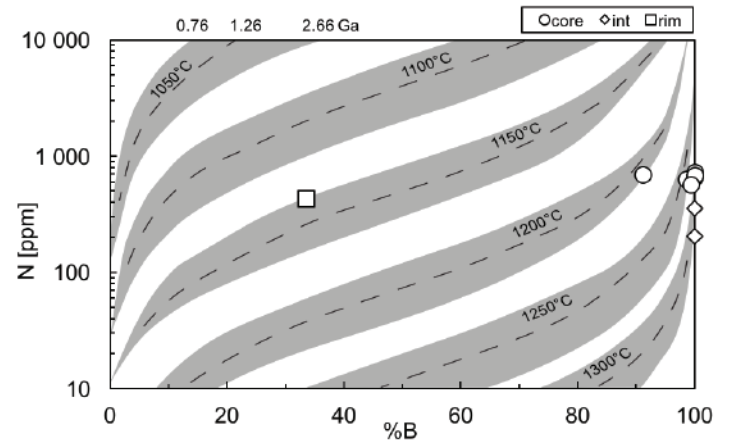
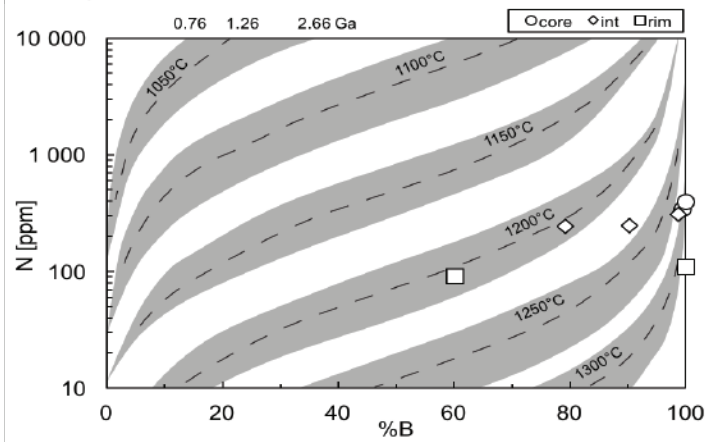
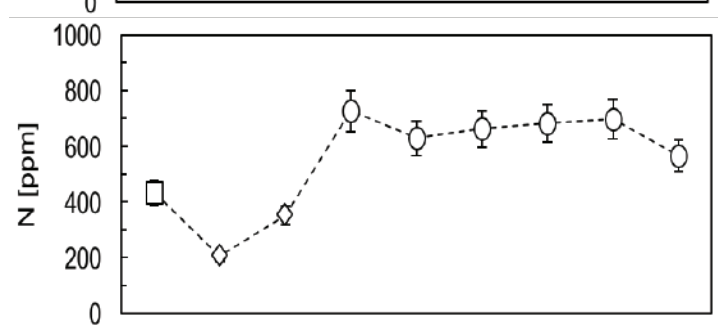
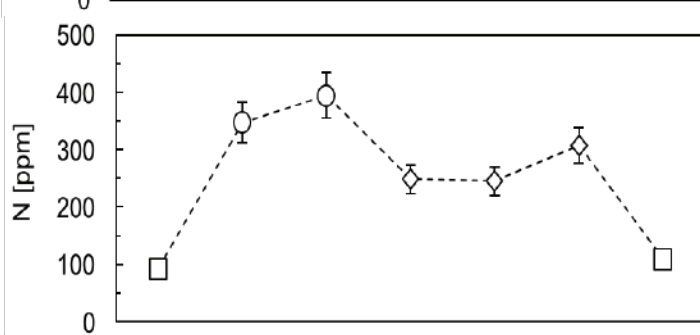
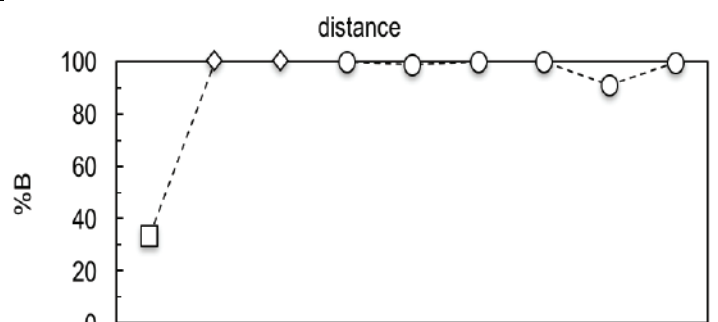
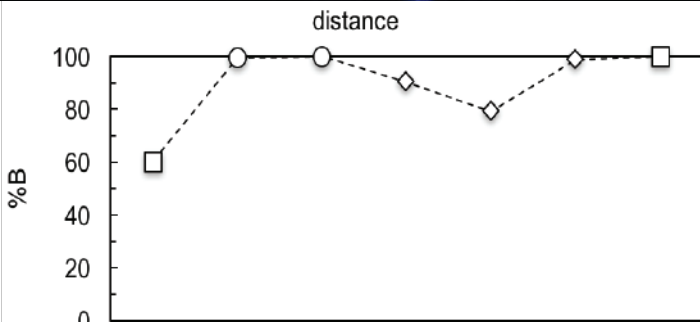
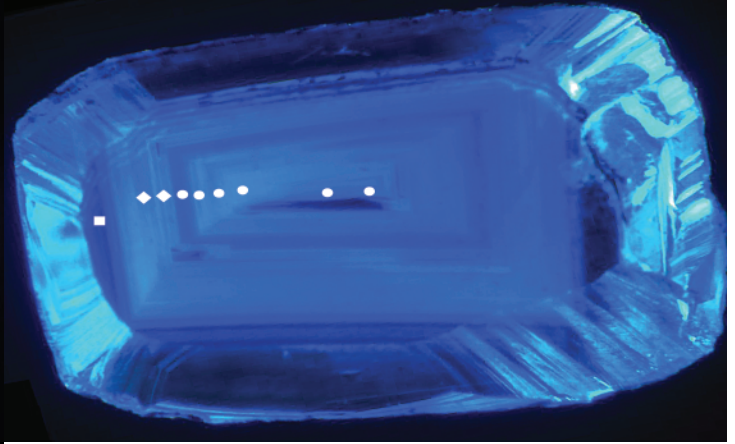
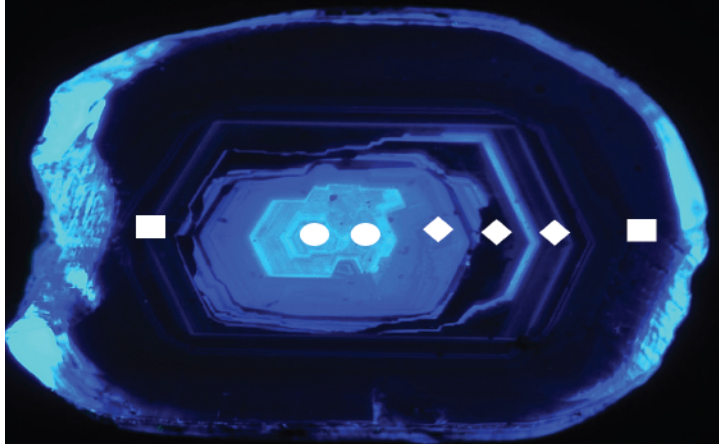
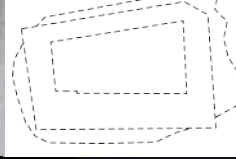
JW179
group: C2
aperture: 75 μ m



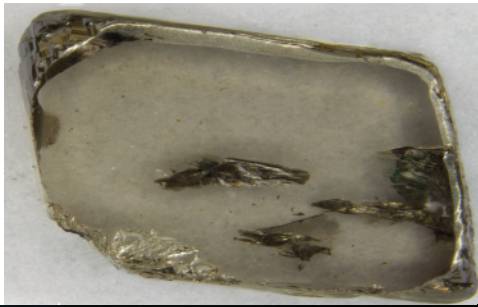
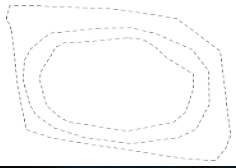
JW180
group: C2
aperture: 60μm



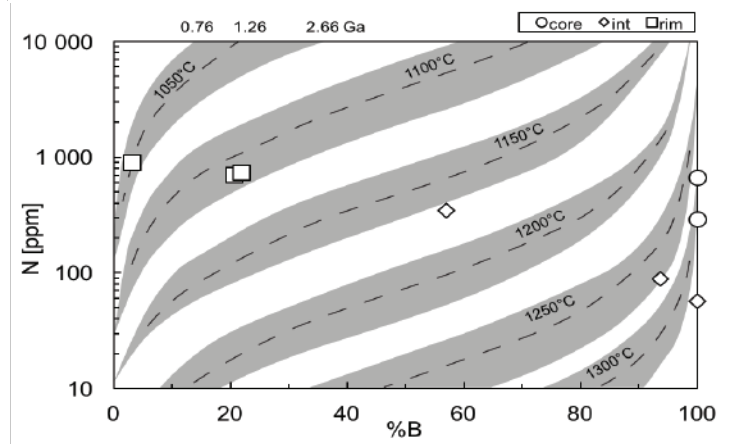
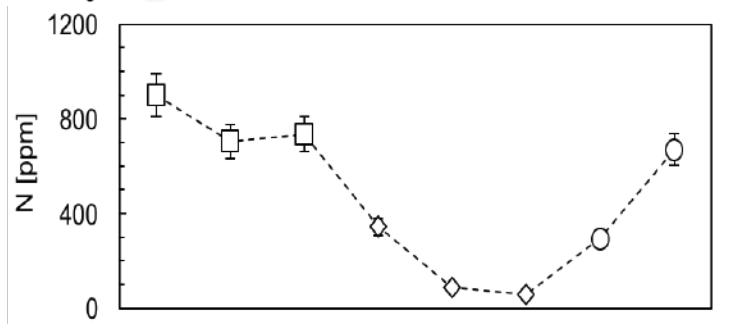
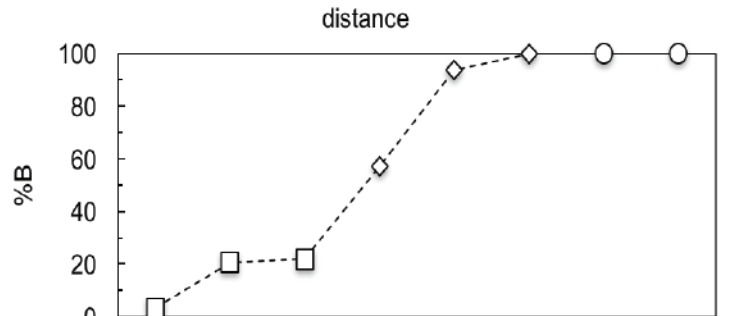
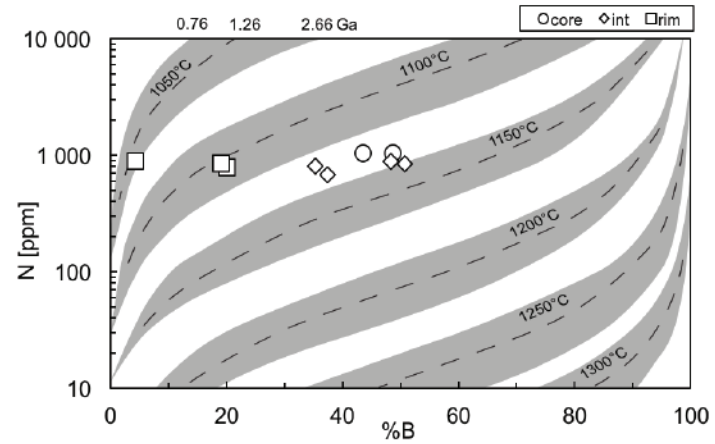
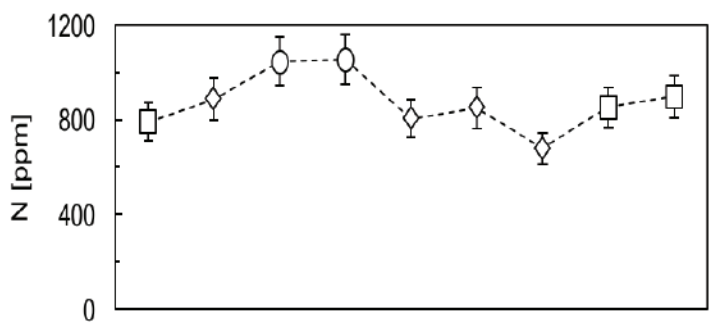
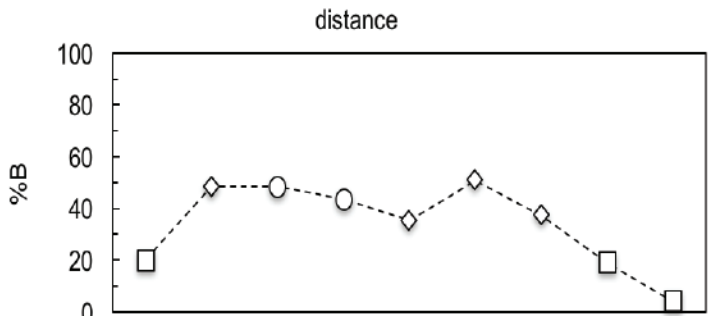
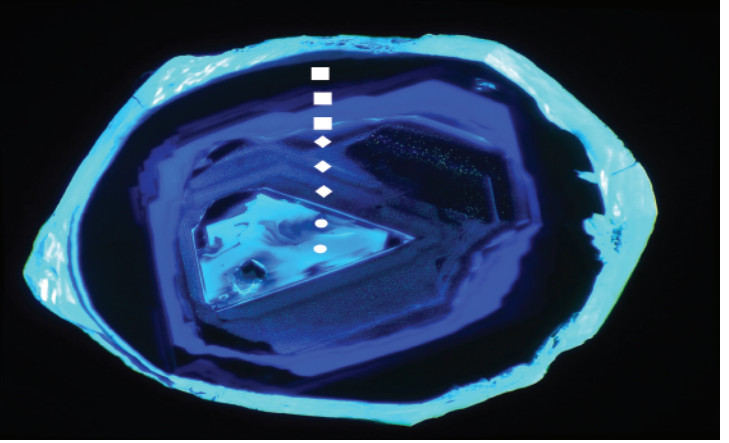
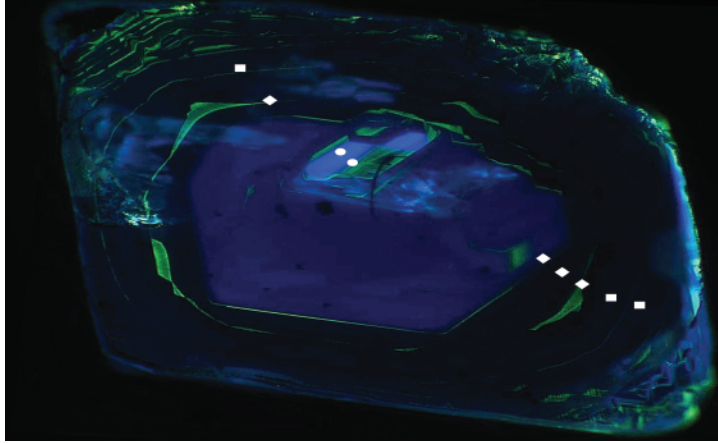
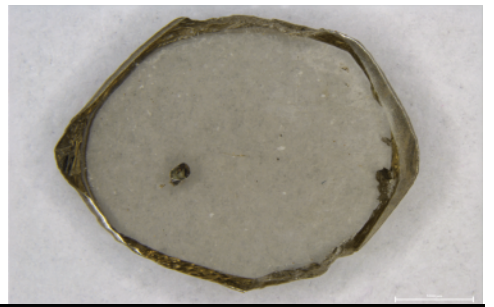
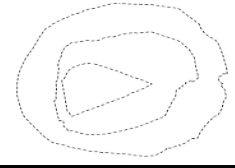
JW183
group: C2
aperture: 50μm



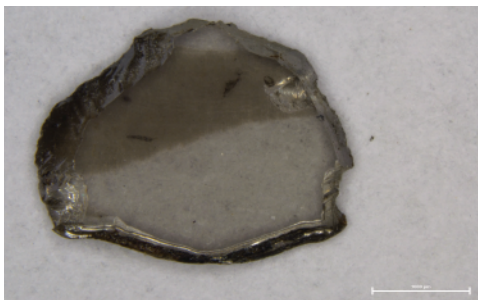
JW185
group: C3
aperture: 70 μ m



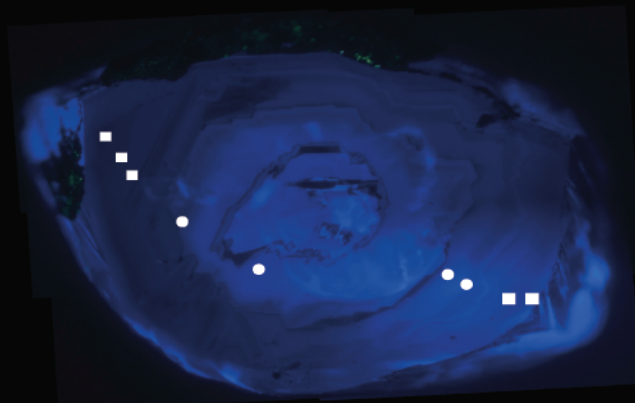
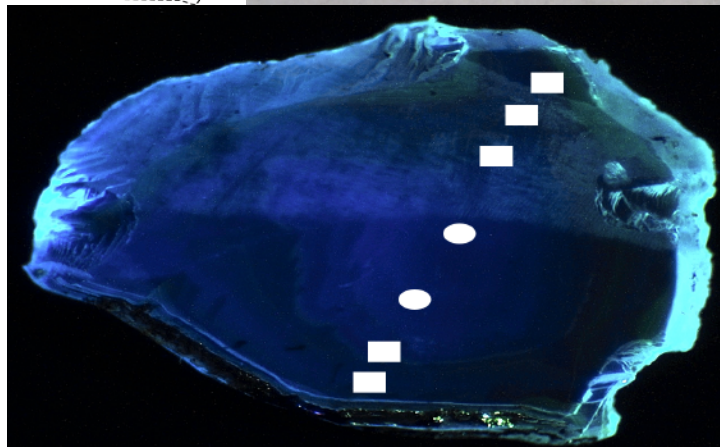
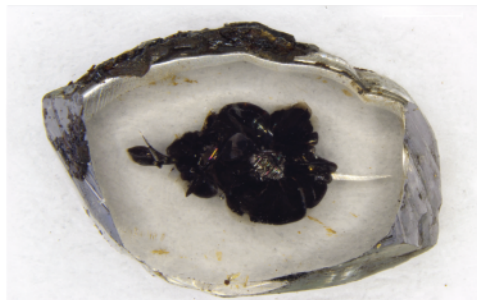
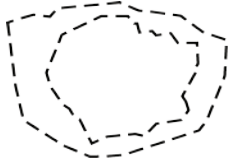
JW194
group: C3
aperture: 75 μ m



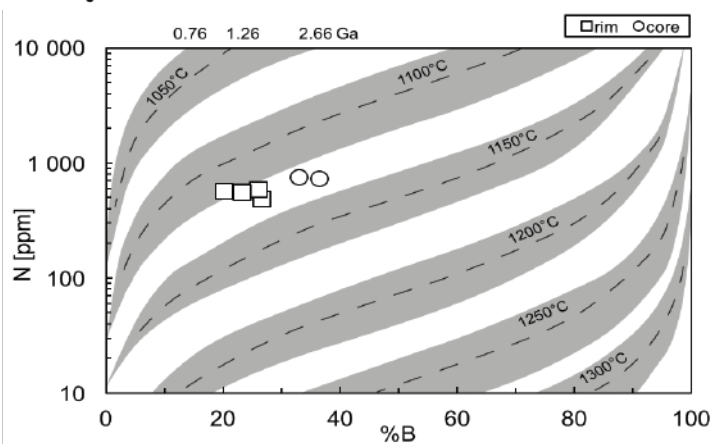
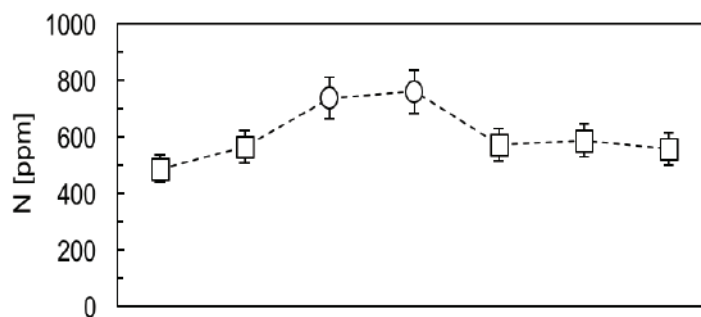
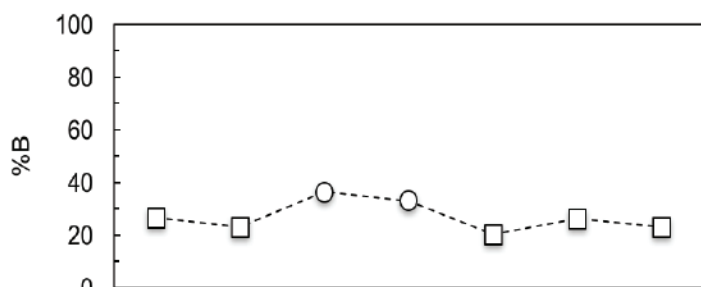
JW196
group: C2
aperture: 70 μ m



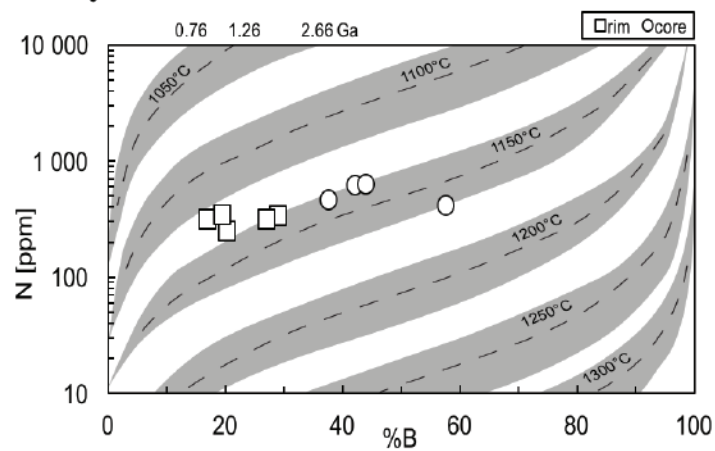
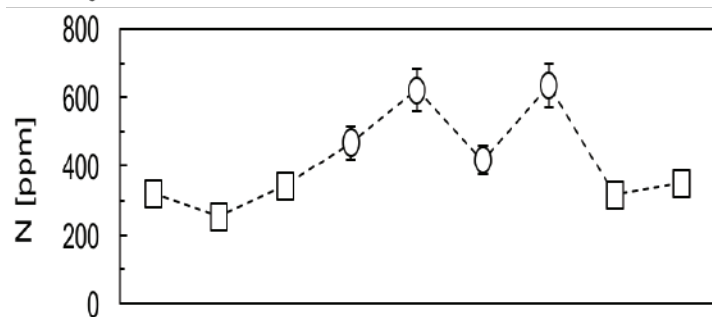
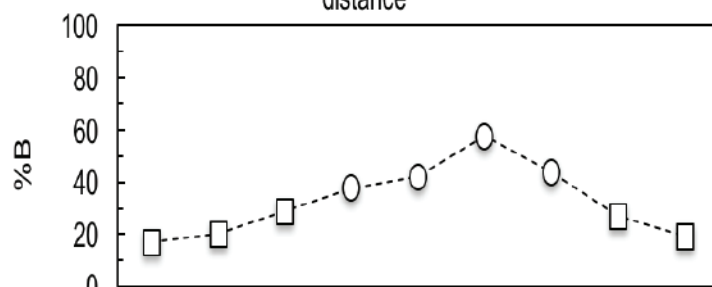
JW210
group: C2
aperture: 75 μ m



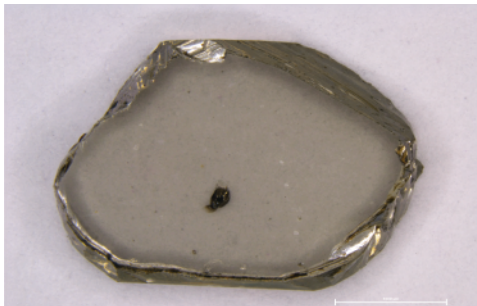
distance



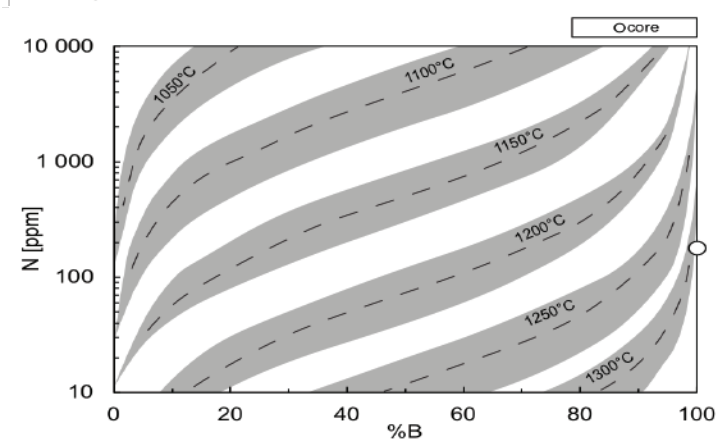
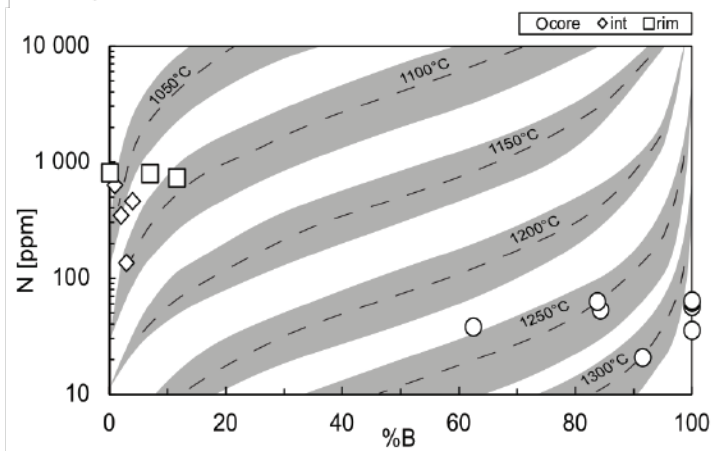
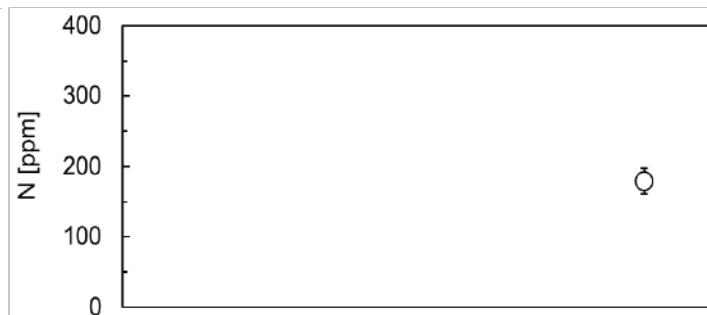
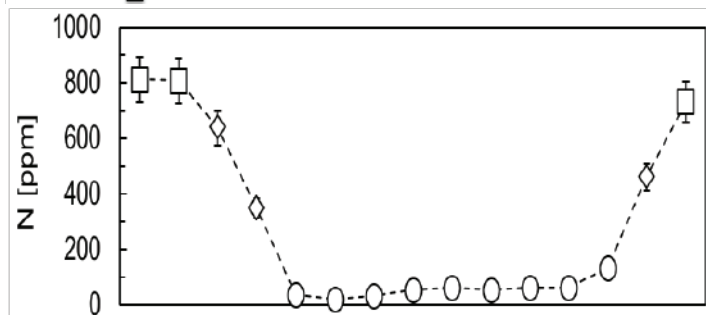
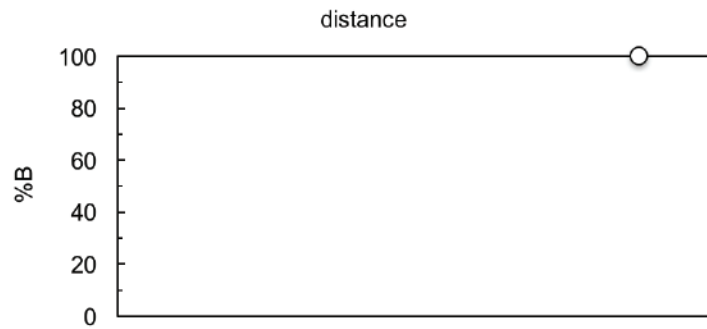
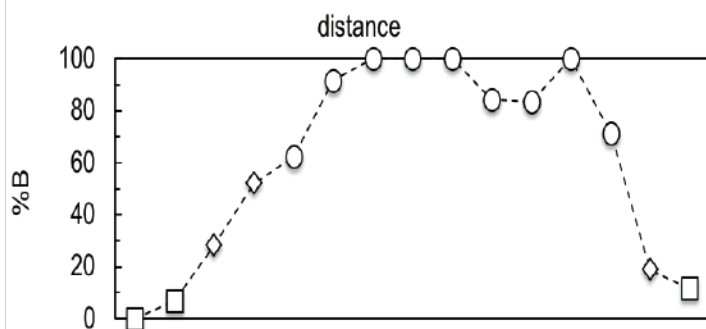
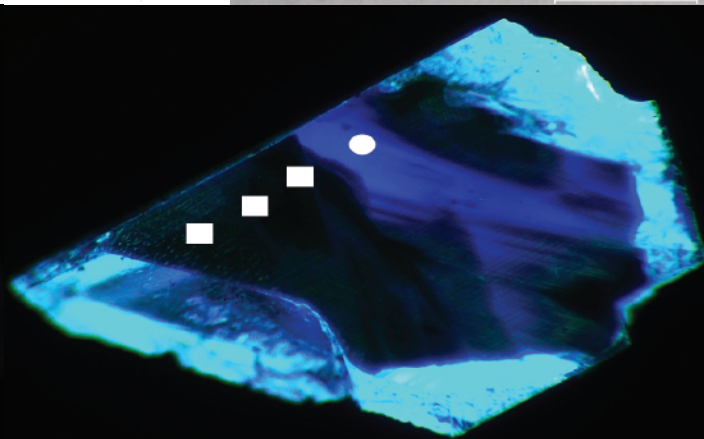
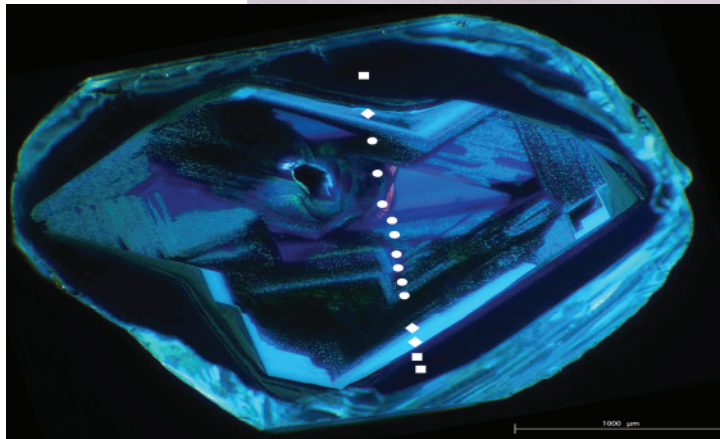
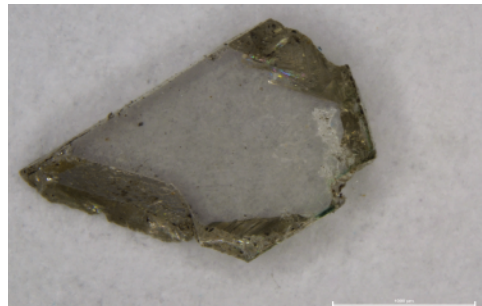
distance



JW211
group: C1
aperture: 50µm



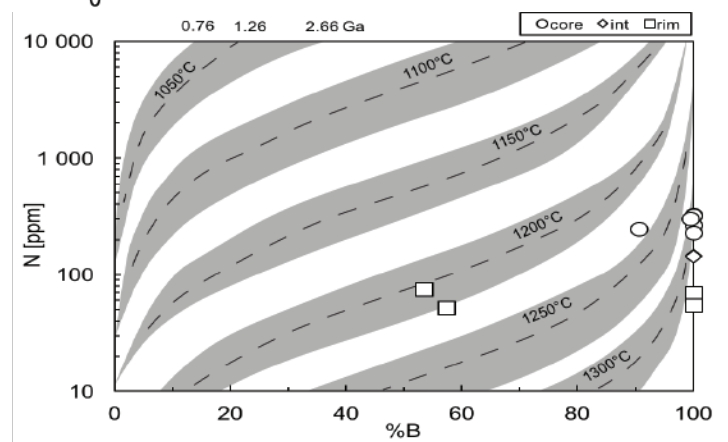
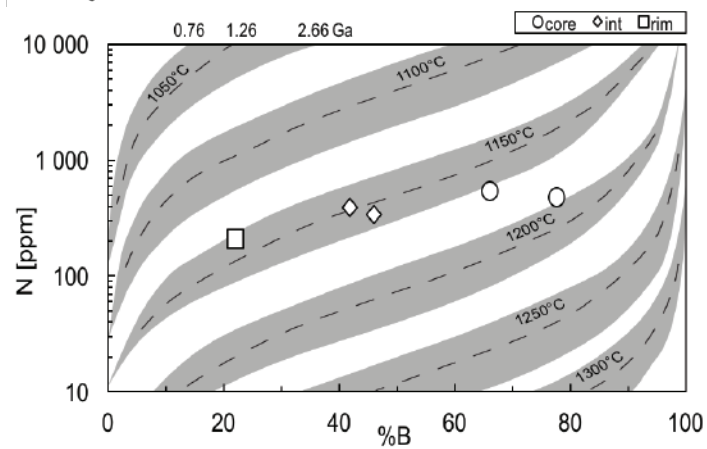
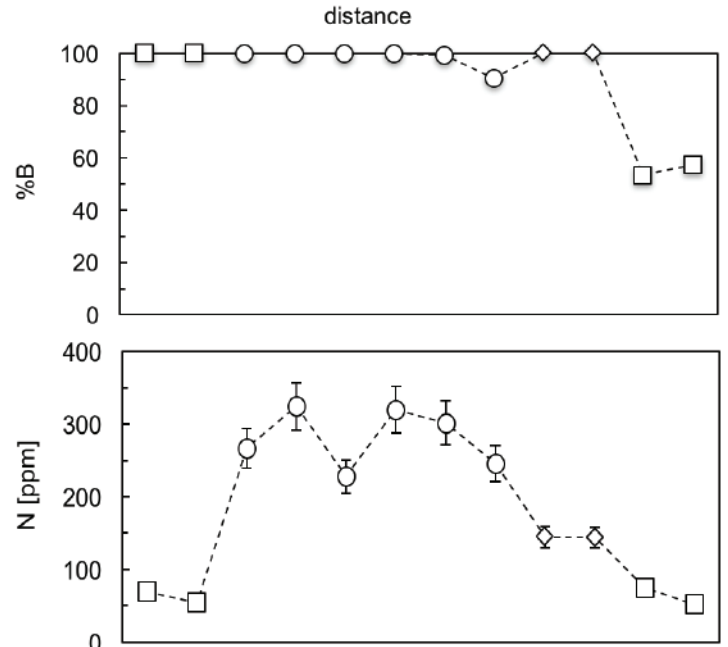
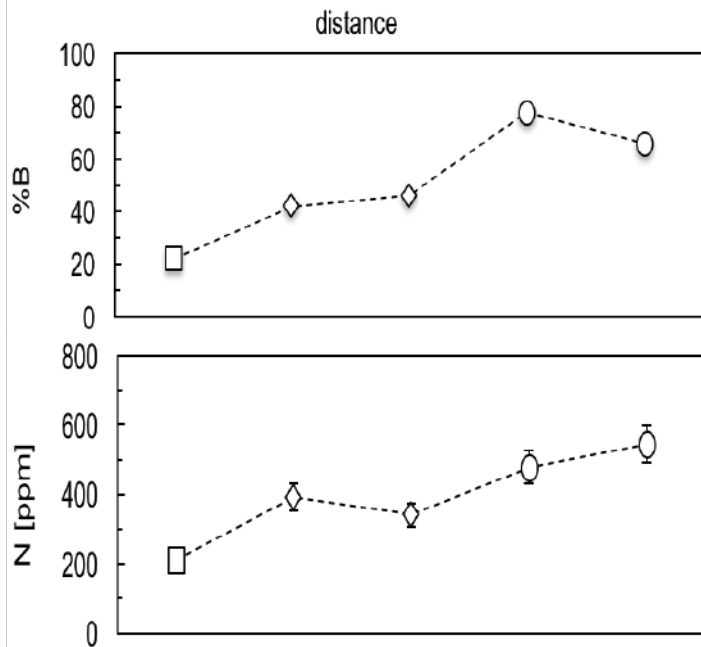
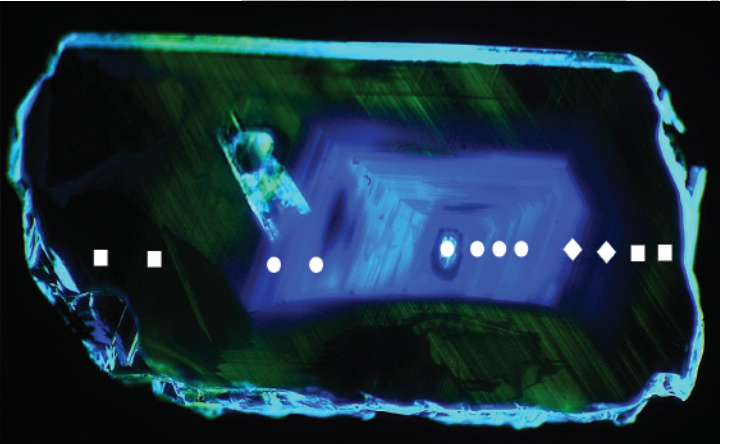
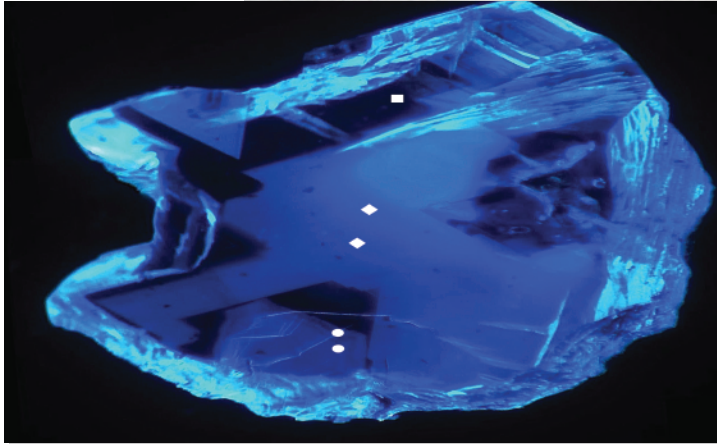
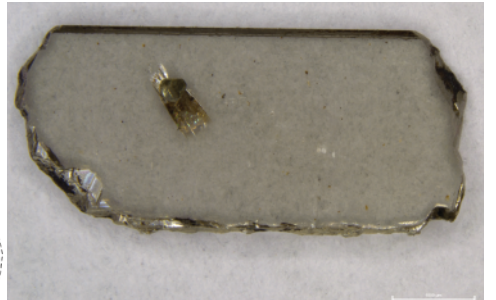
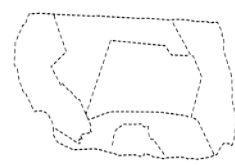
JW230
group: C2
aperture: 75µm



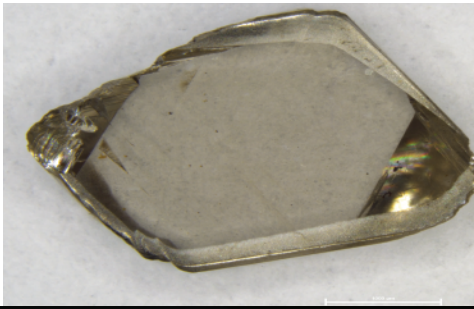
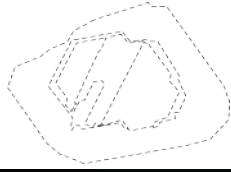
JW231
group: C2
aperture: 50 μ m



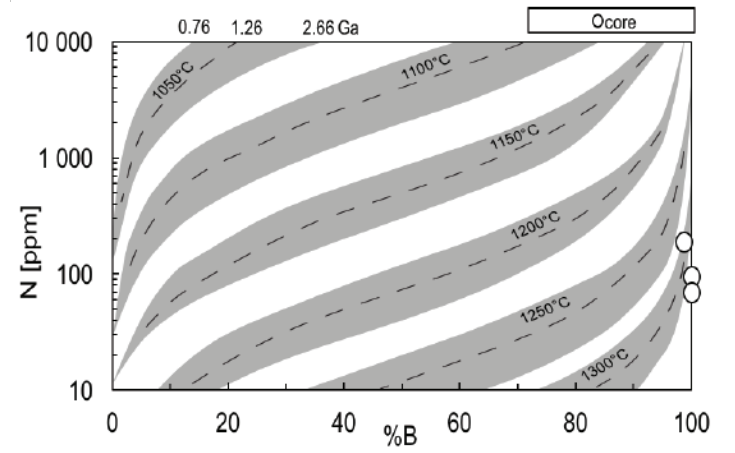
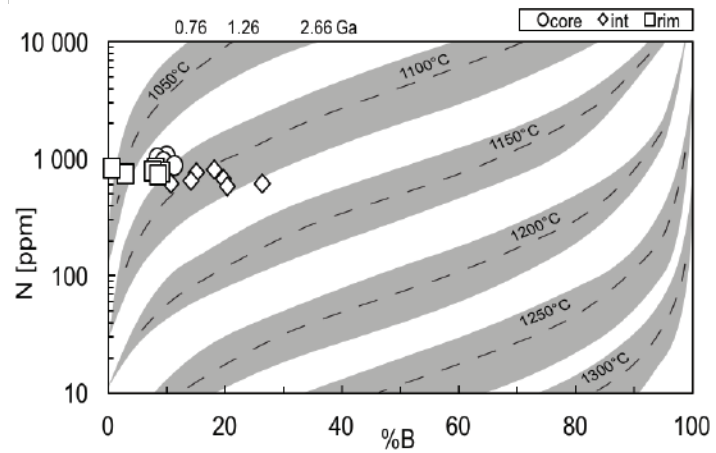
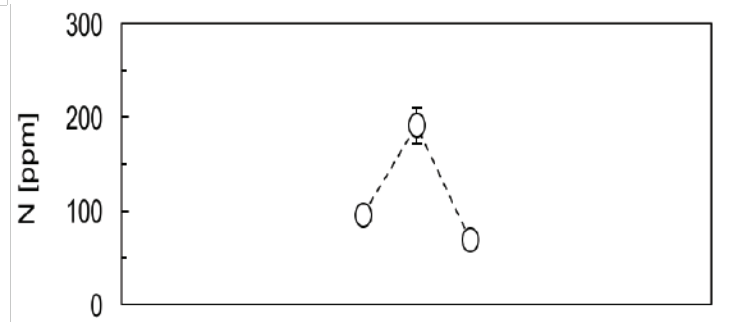
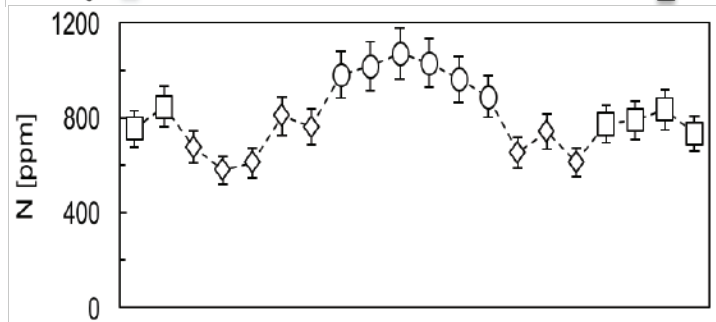
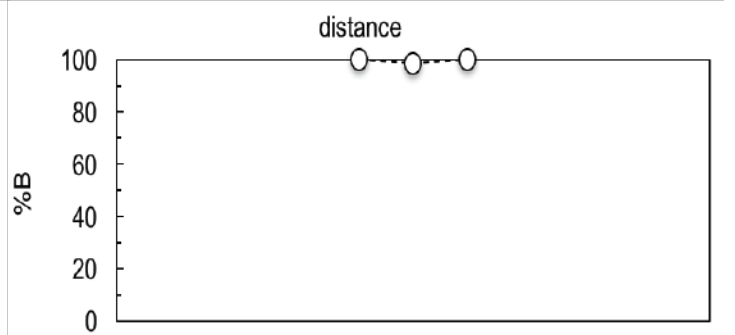
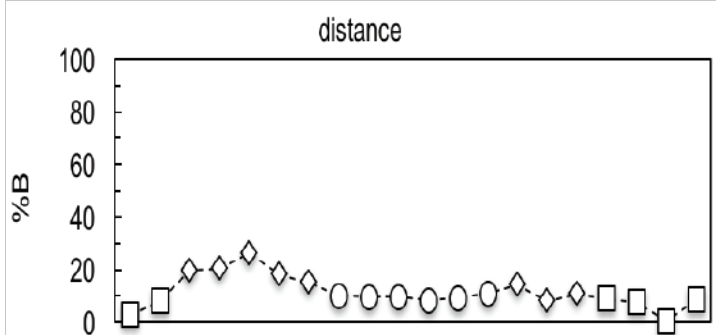
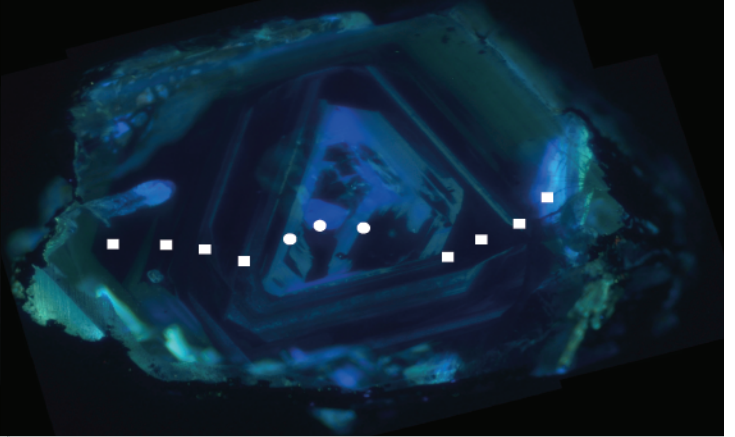
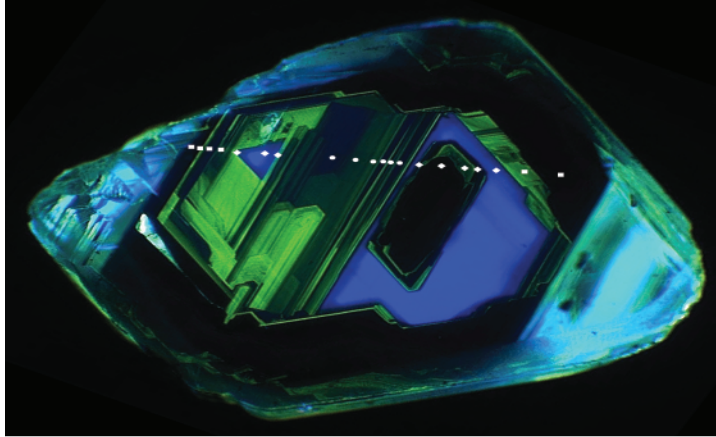
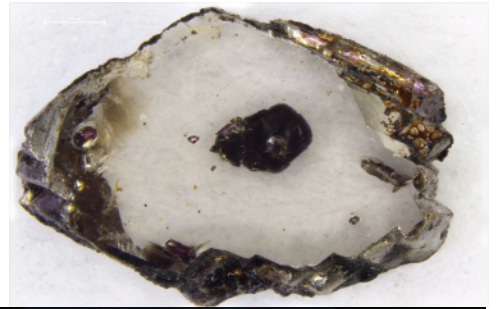
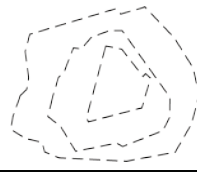
JW238
group: C2
aperture: 75 μ m



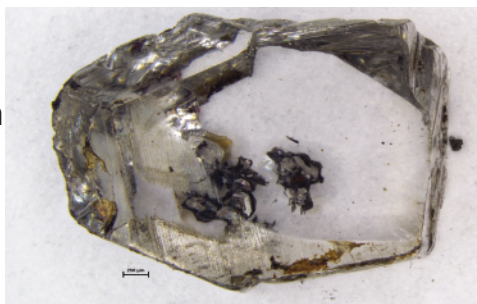
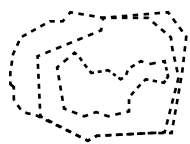
JW239
group: C3
aperture: 50 μ m



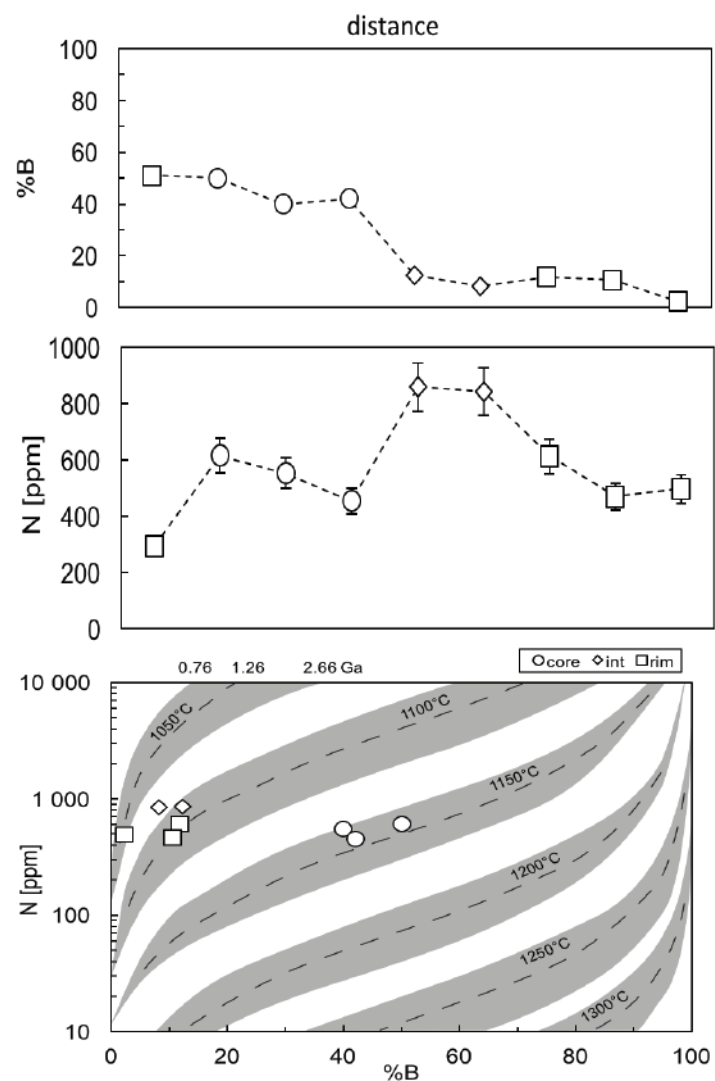
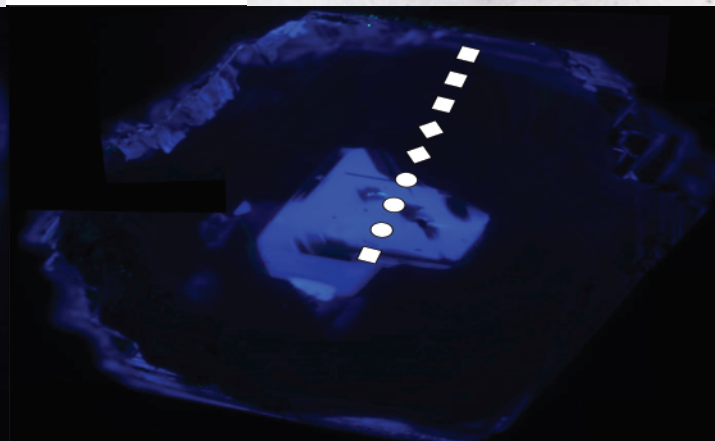
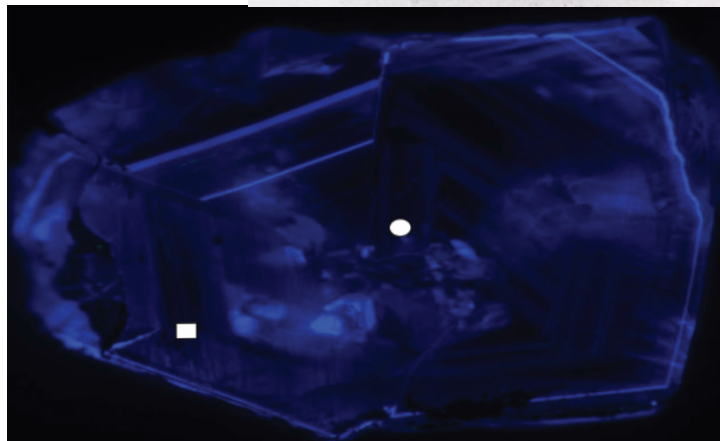
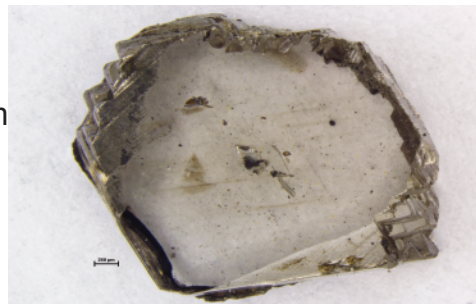
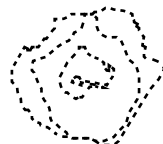
JW243
group: C2
aperture: 75 μ m



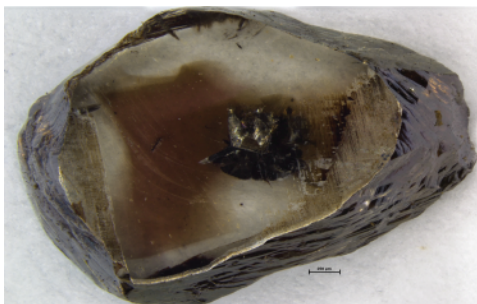
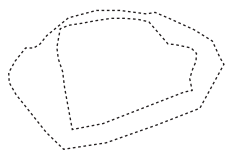
JW269
group: A
aperture: 100 μ m



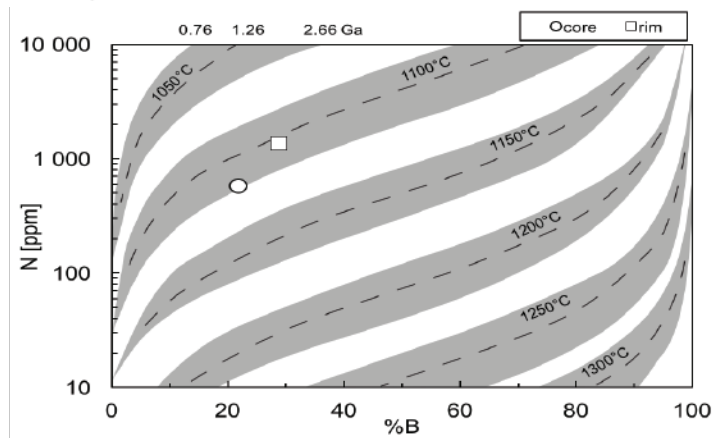
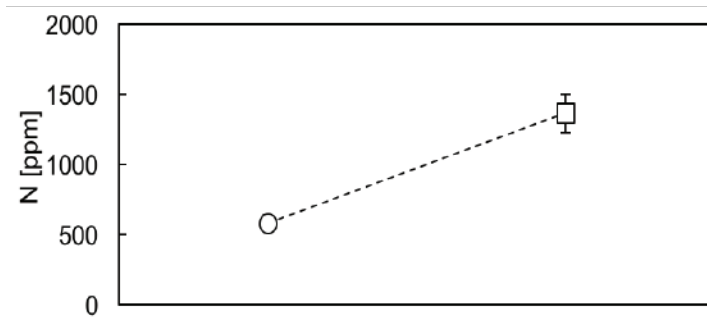
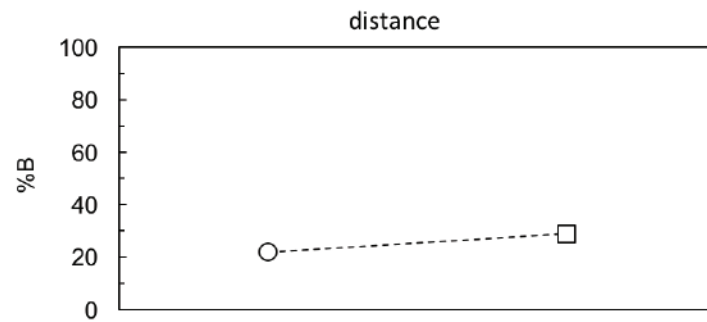
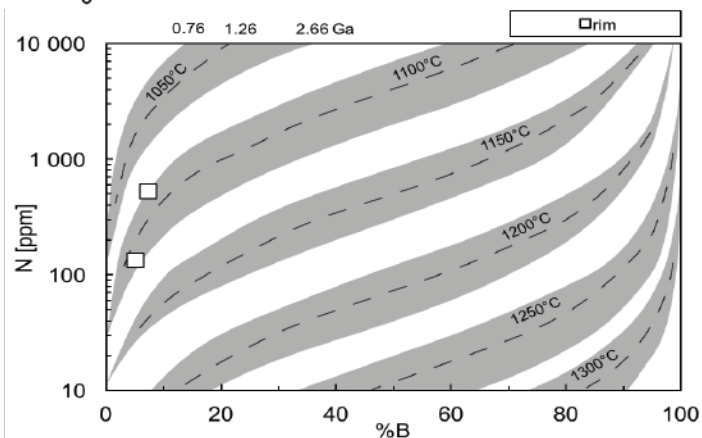
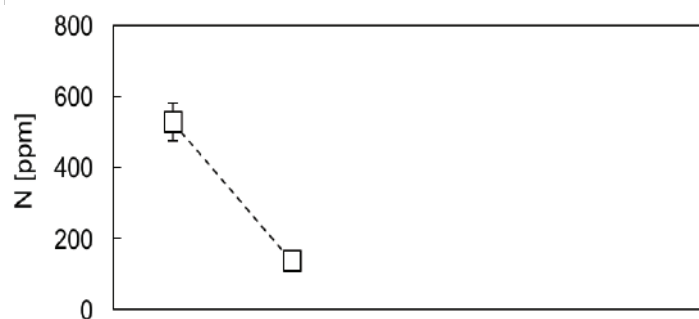
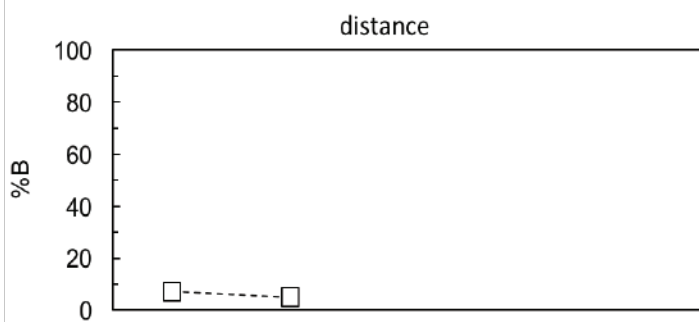
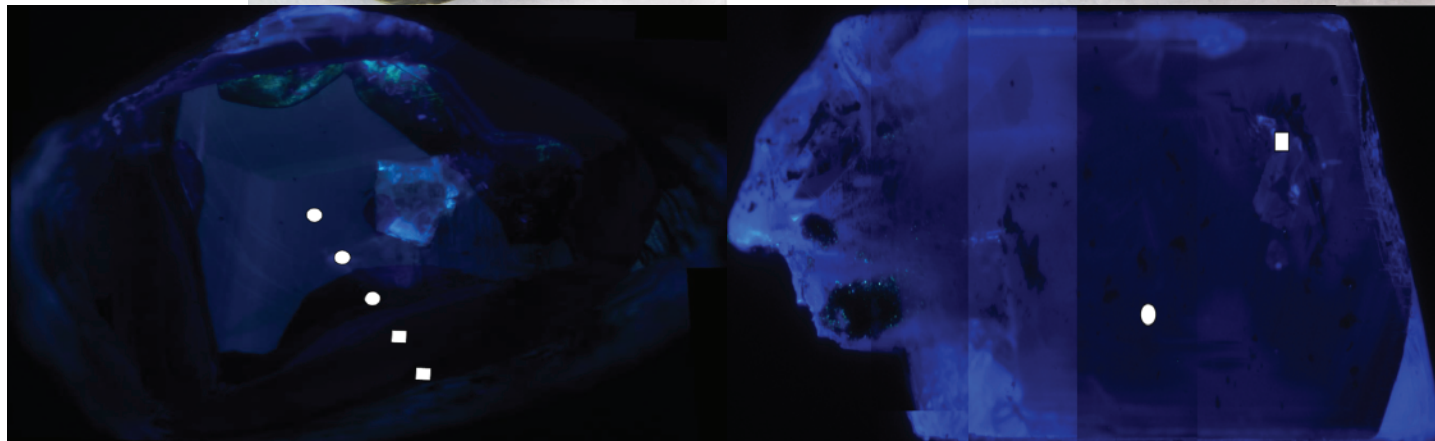
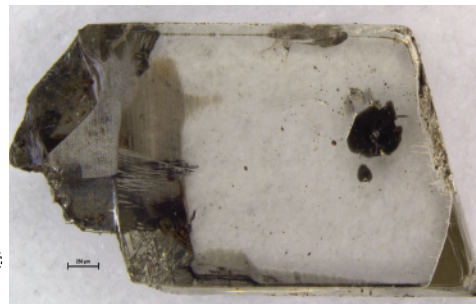
JW271
group: C3
aperture: 100 μ m



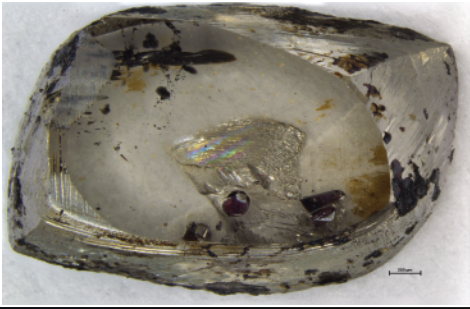
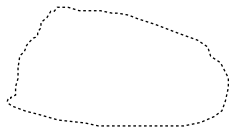
JW276
group: C1
aperture: 50µm



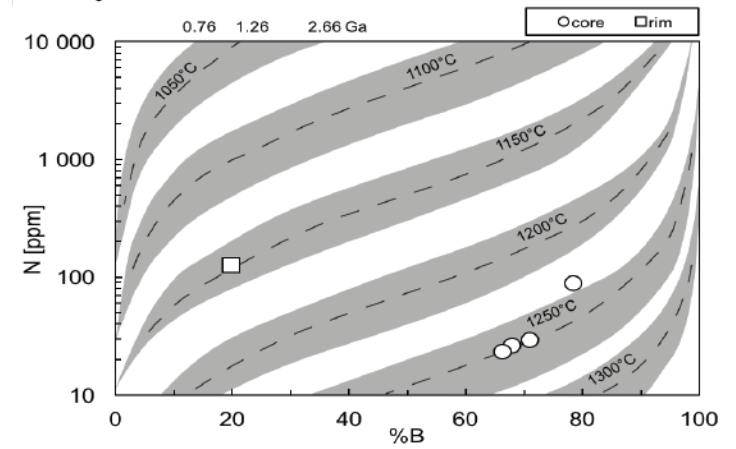
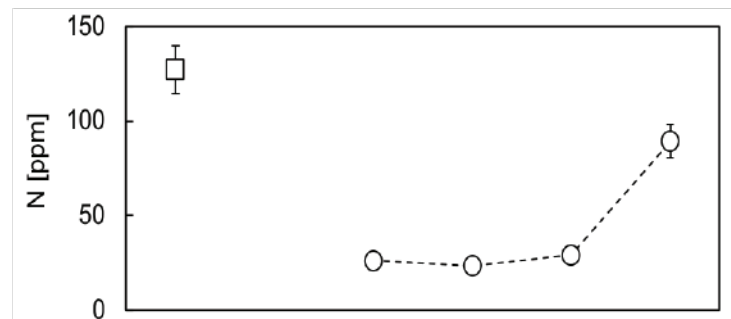
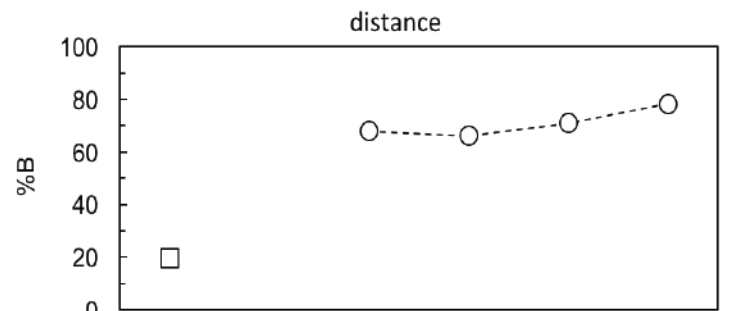
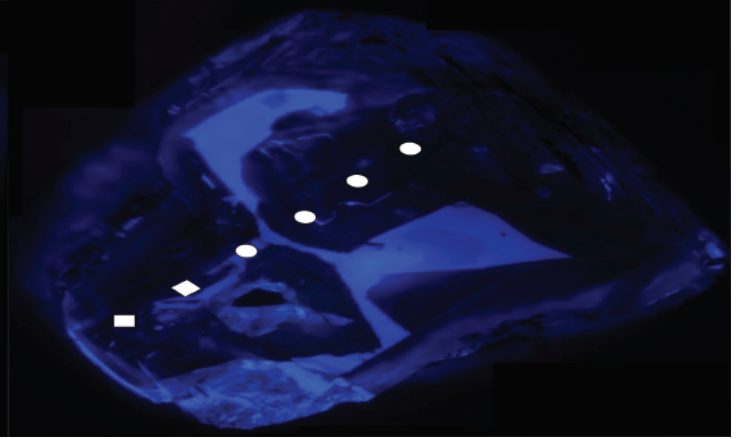
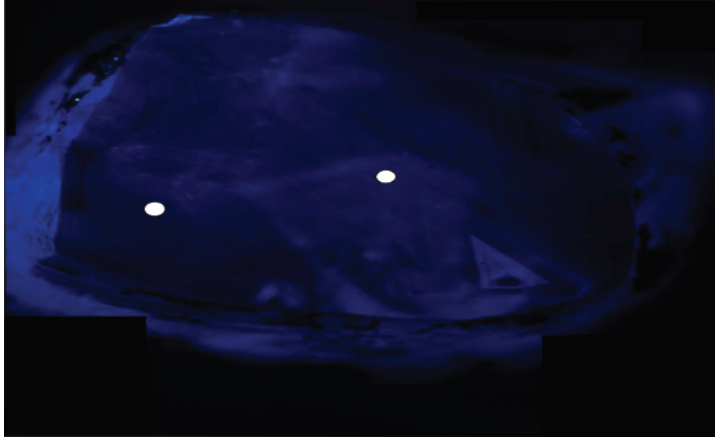
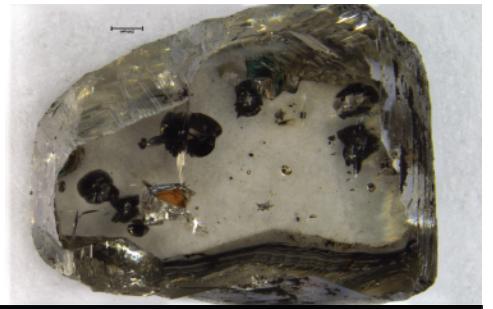
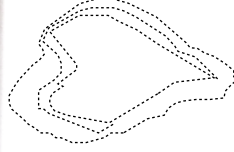
JW331
group: C1
aperture: 50µm



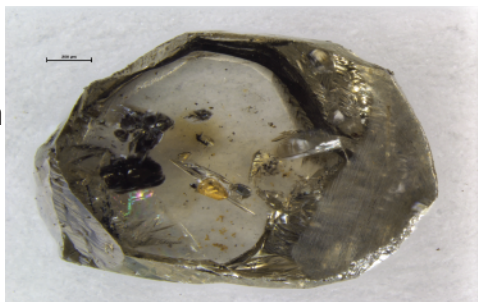
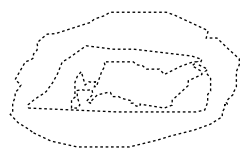
JW332
group: A
aperture: 100μm



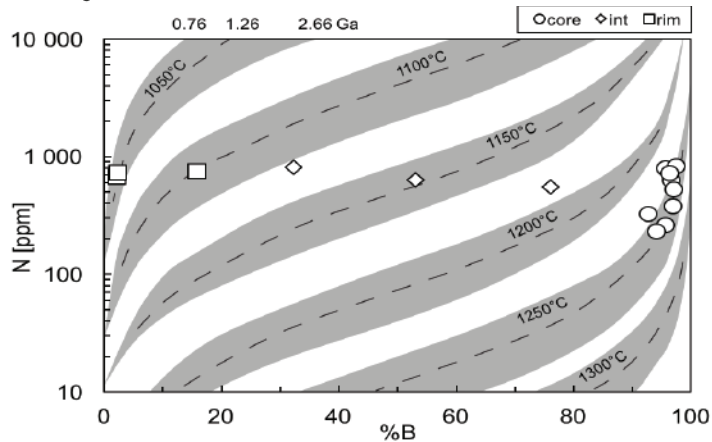
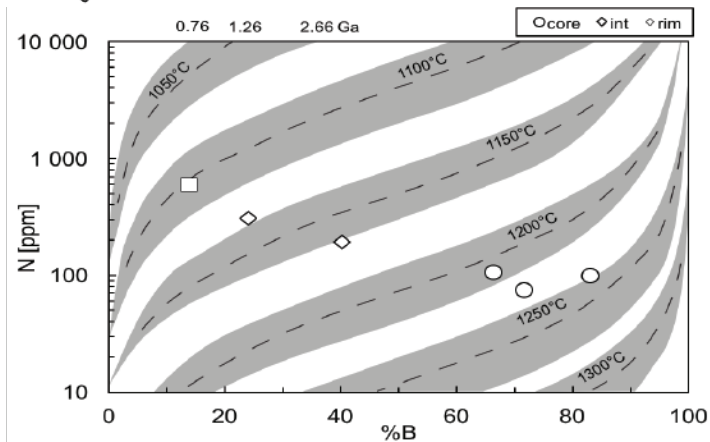
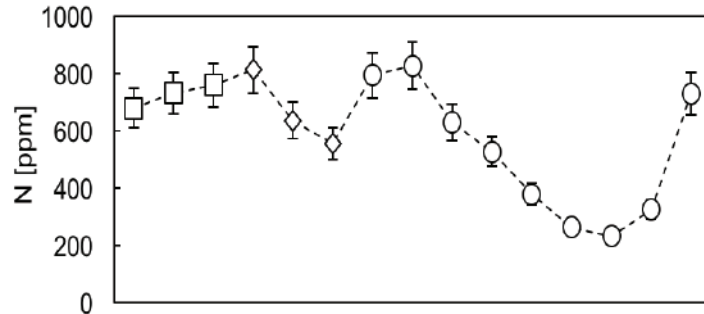
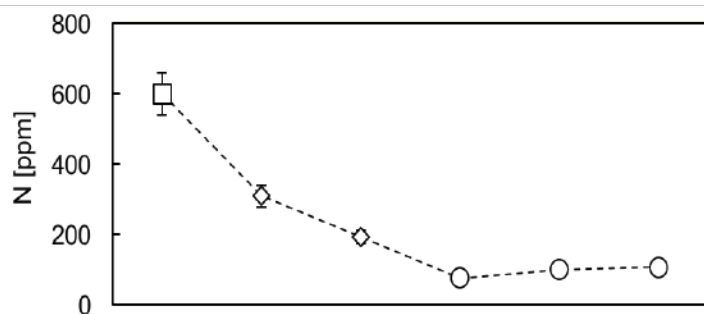
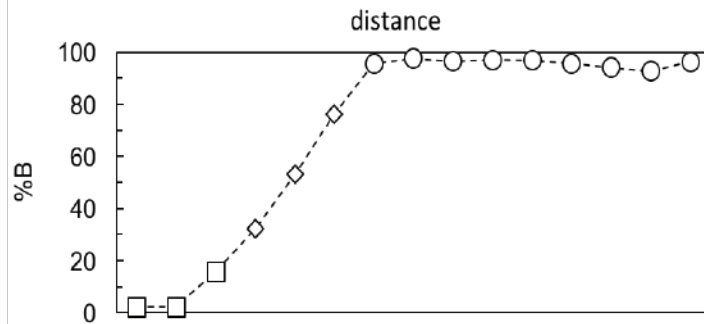
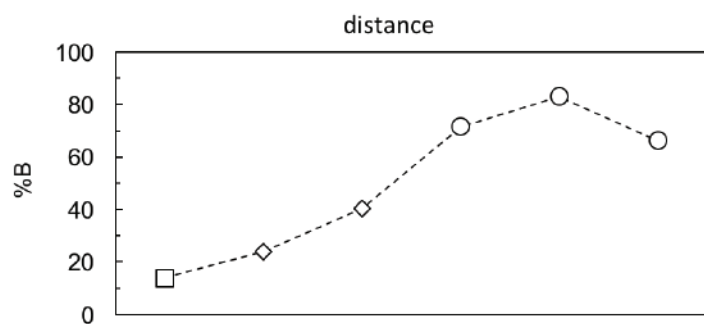
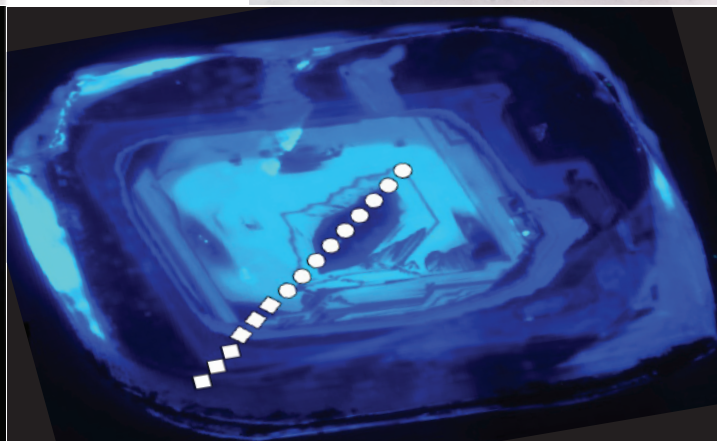
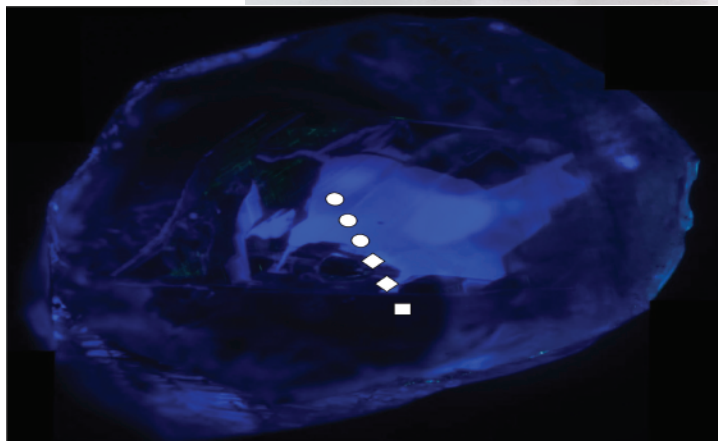
JW336
group: C1
aperture: 100μm



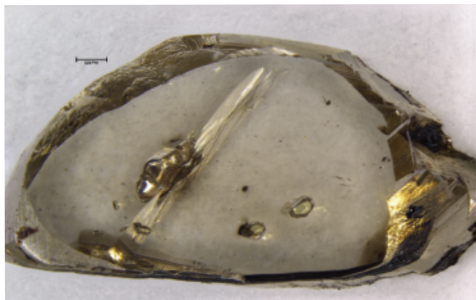
JW346
group: C1
aperture: 100 μ m



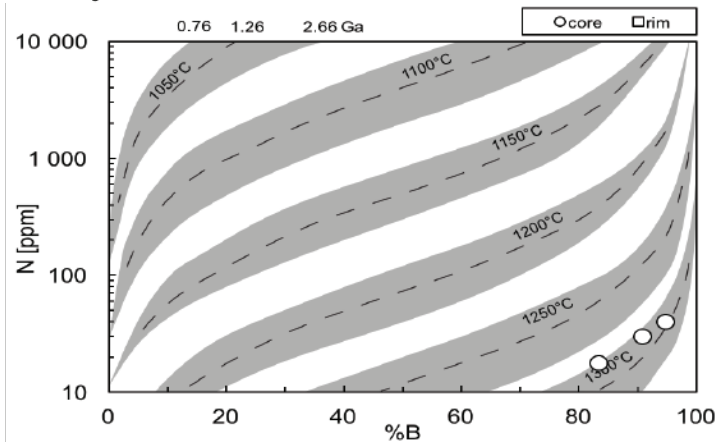
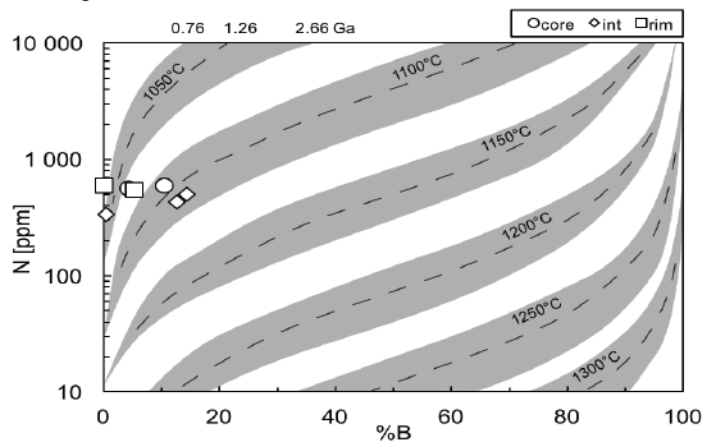
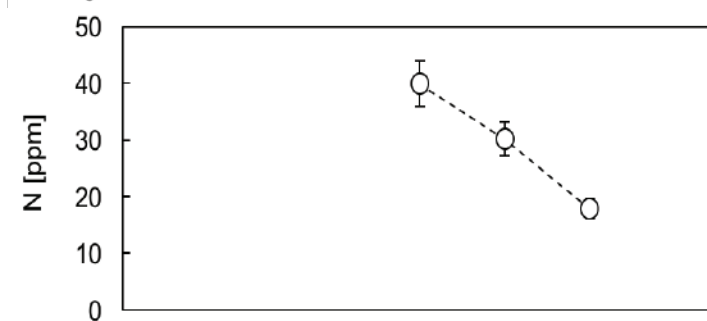
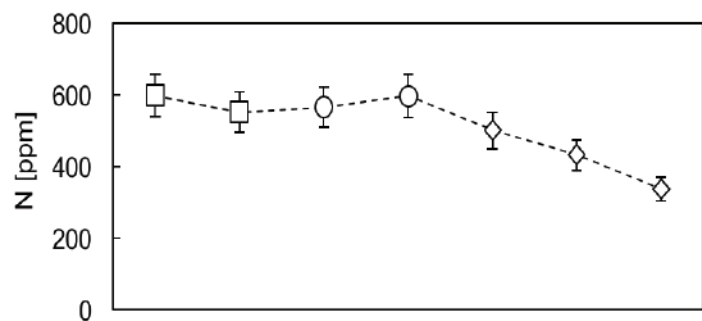
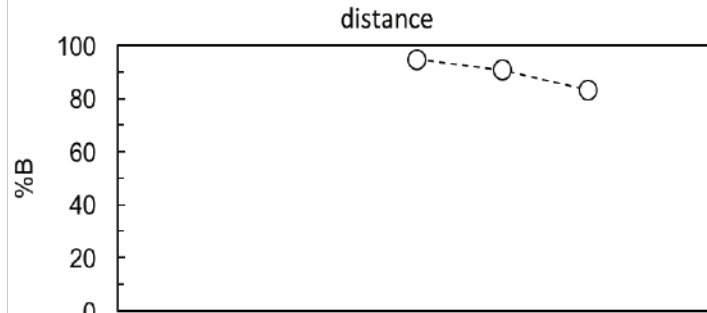
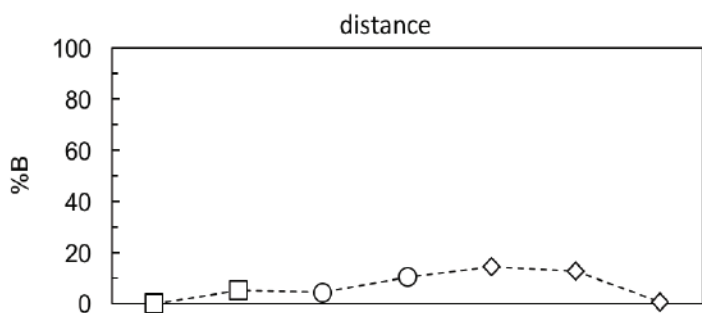
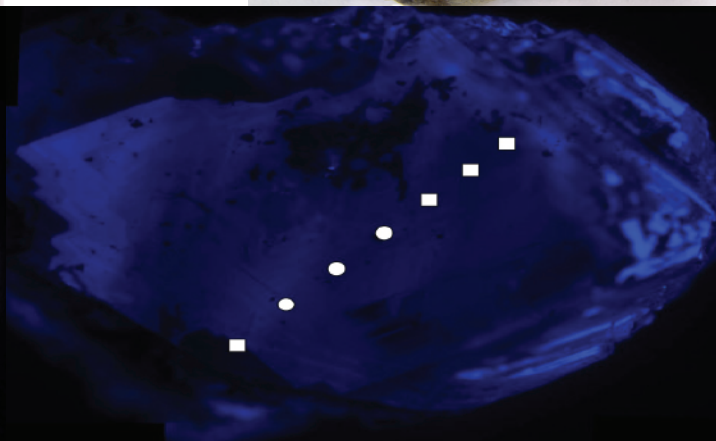
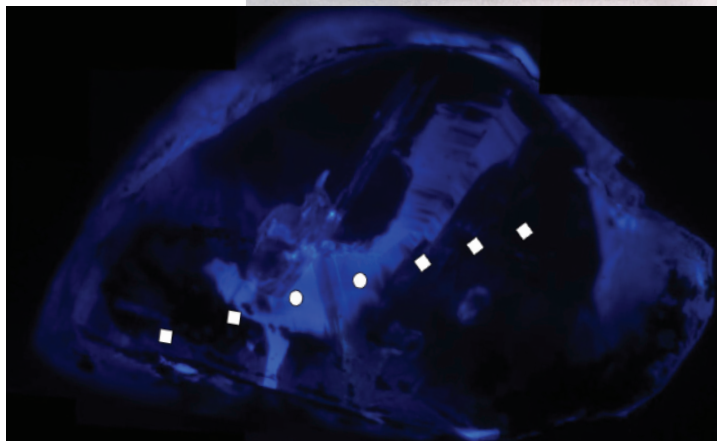
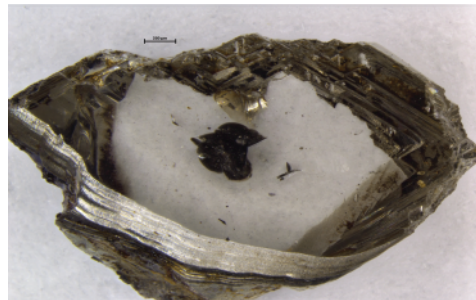
JW351
group: C3
aperture: 50 μ m



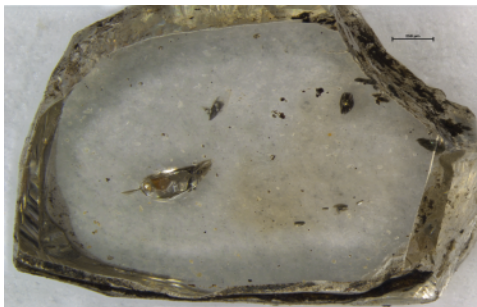
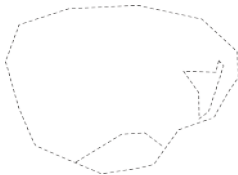
JW355
group: C2
aperture: 50 μ m



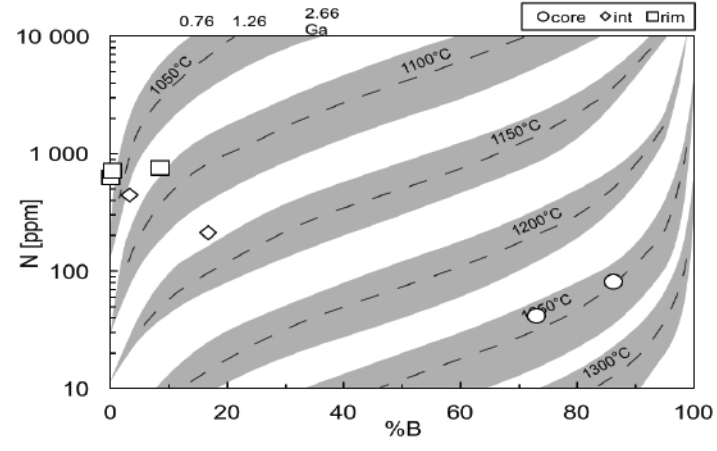
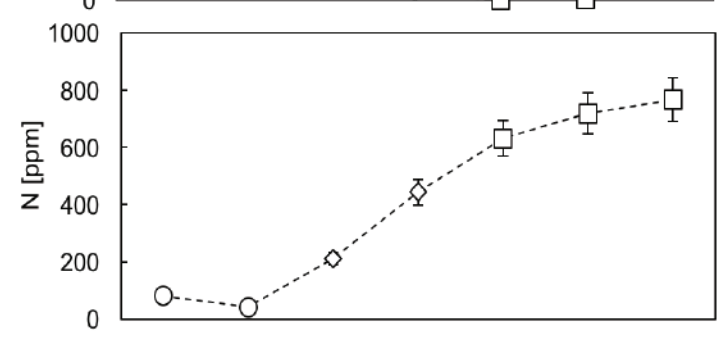
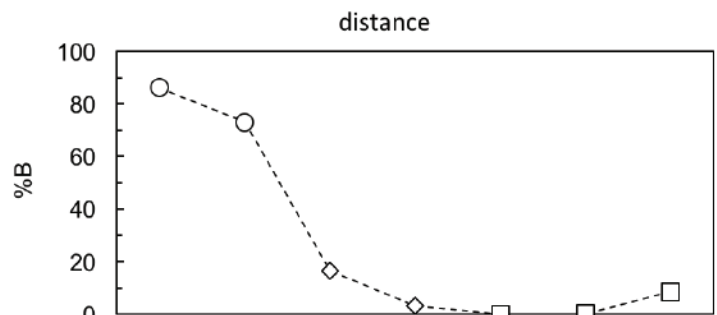
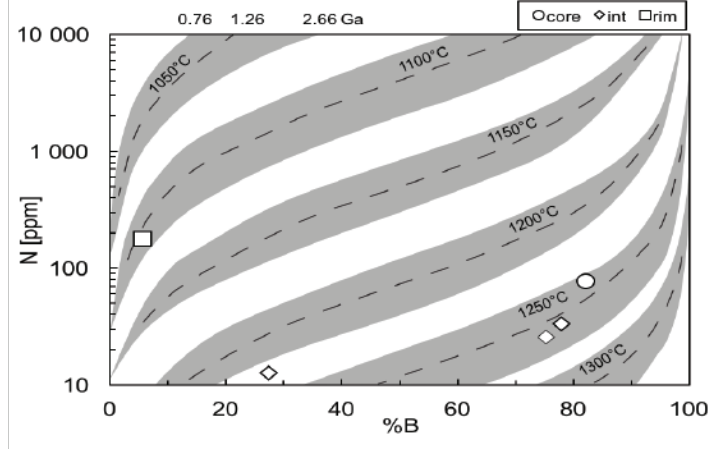
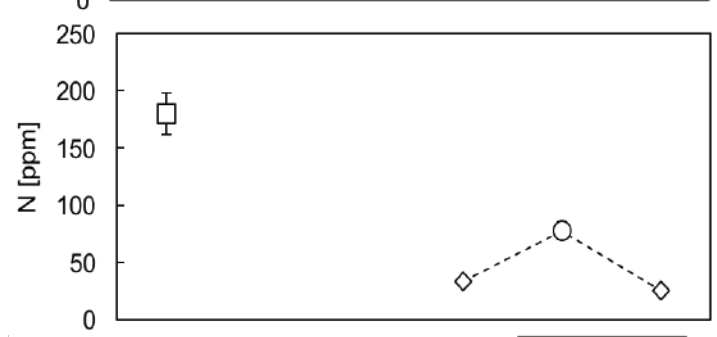
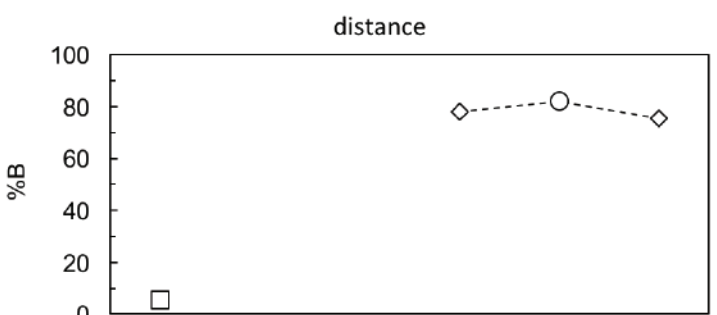
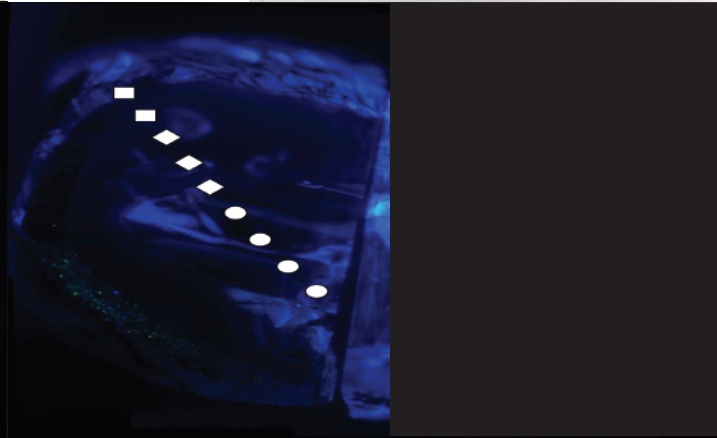
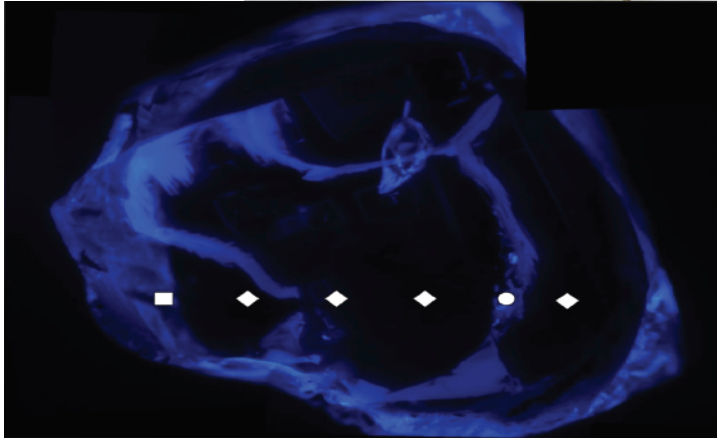
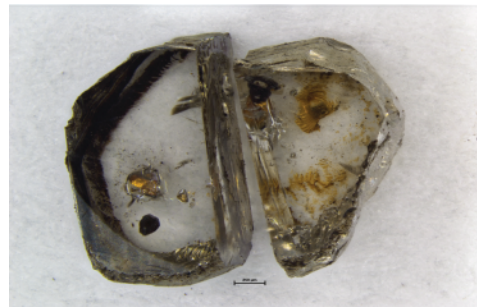
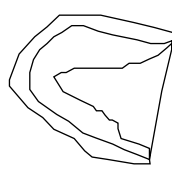
JW364
group: C2
aperture: 50 μ m



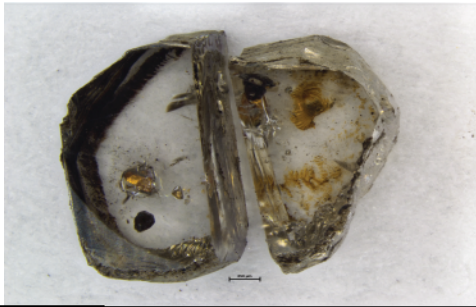
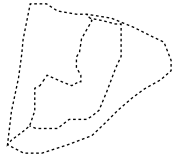
JW376
group: C1
aperture: 40μm



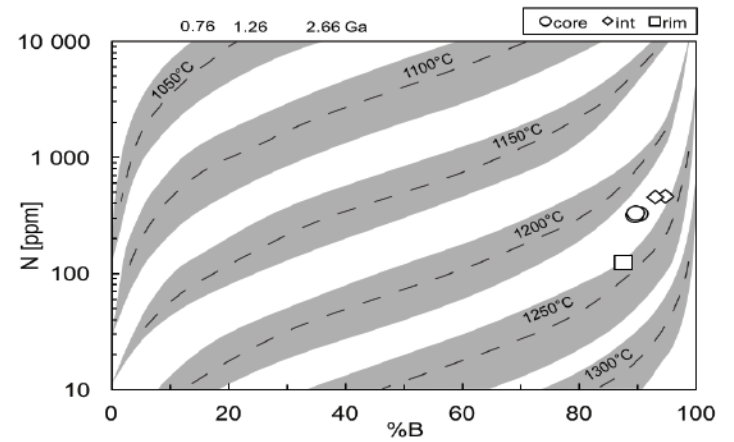
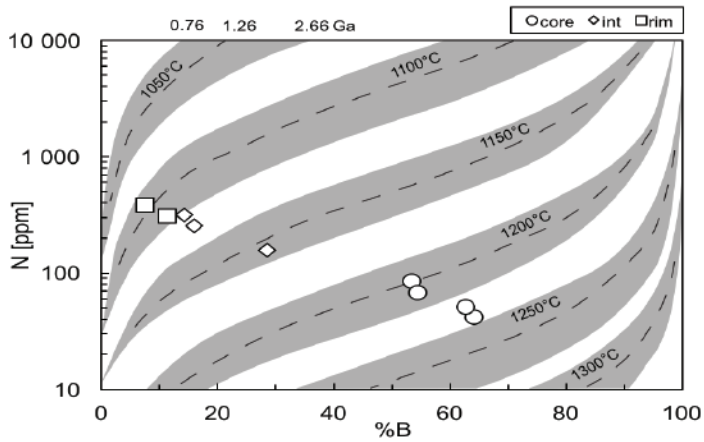
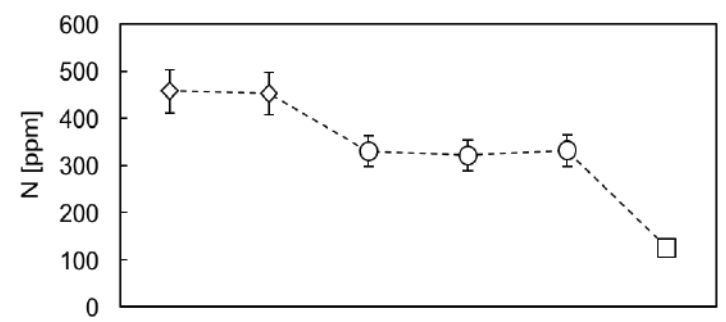
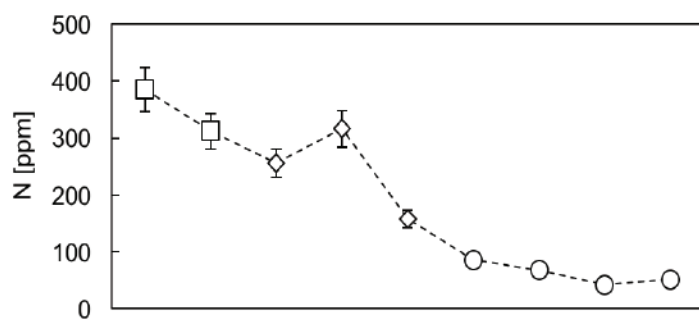
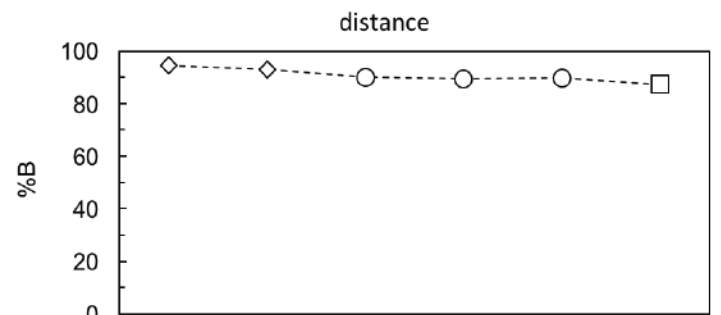
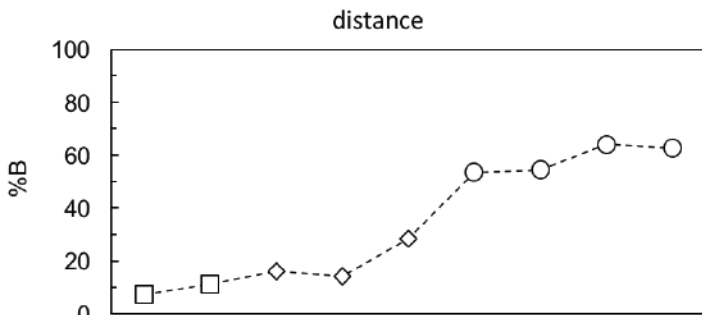
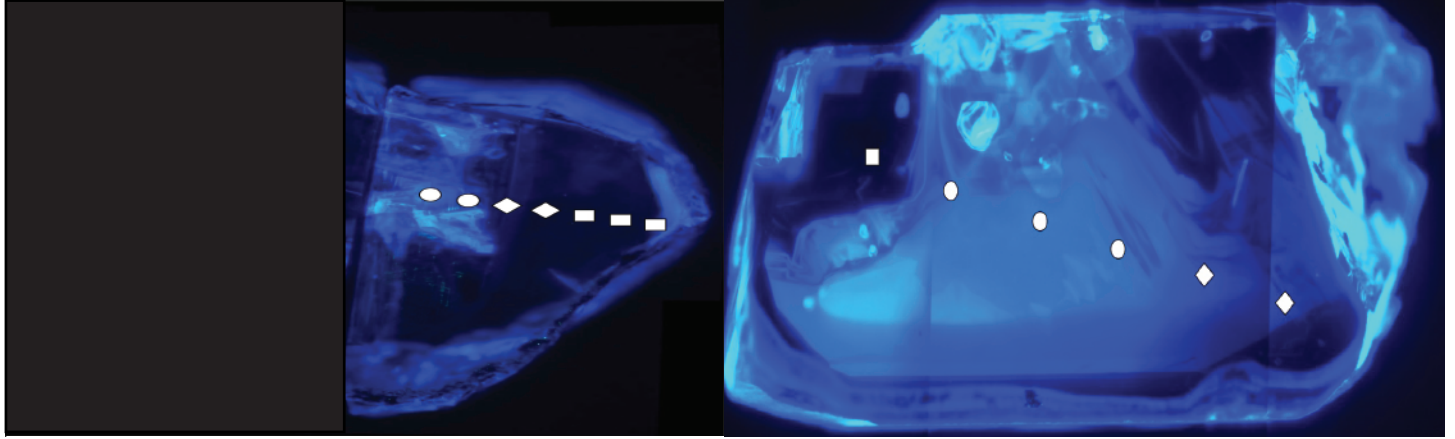
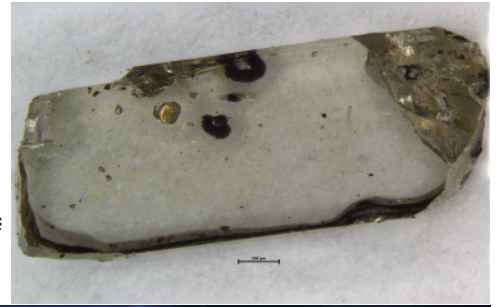
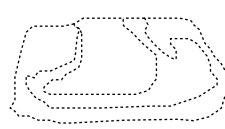
JW381a
group: C1
aperture: 50μm



JW381b
group: C1
aperture: 50µm

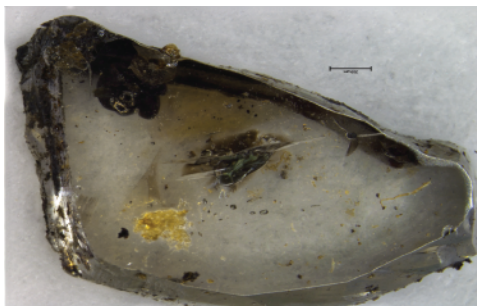


JW397
group: C3
aperture: 50µm



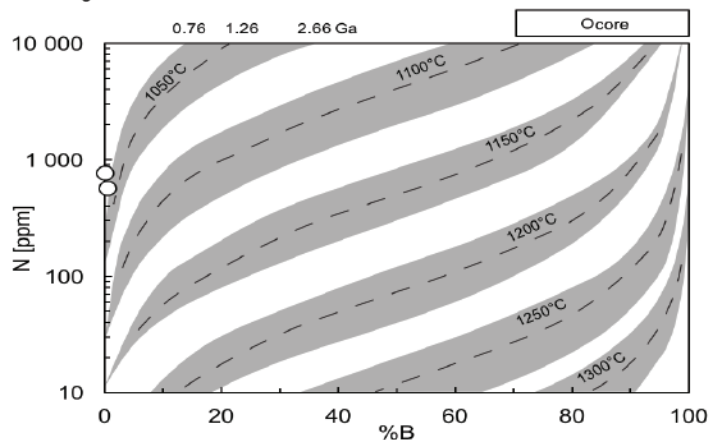
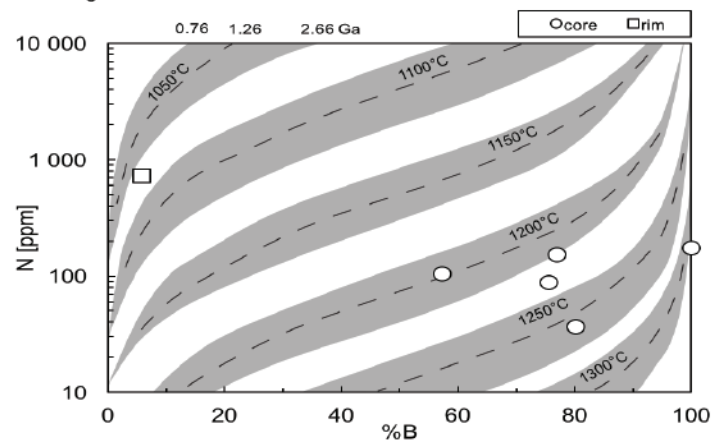
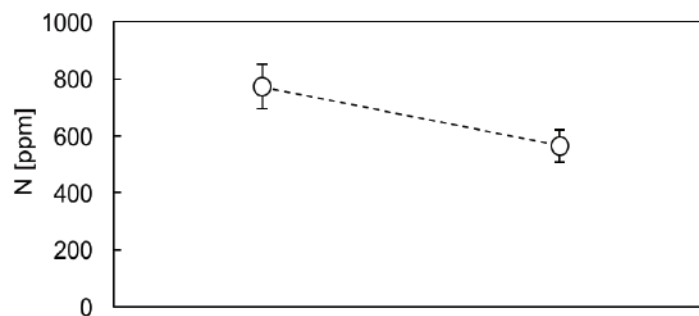
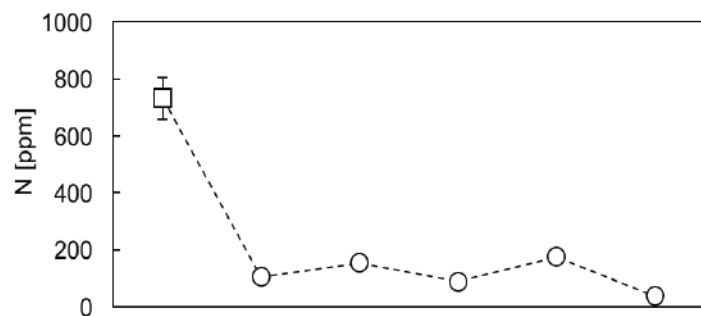
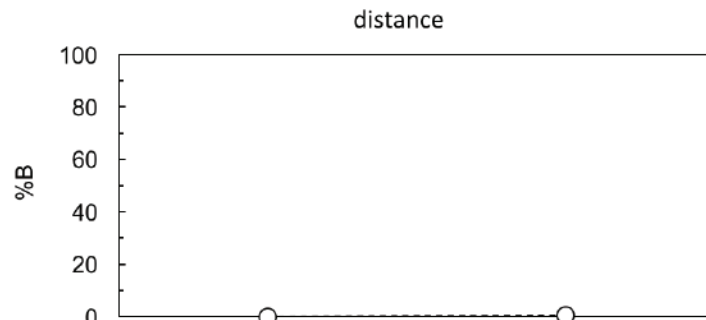
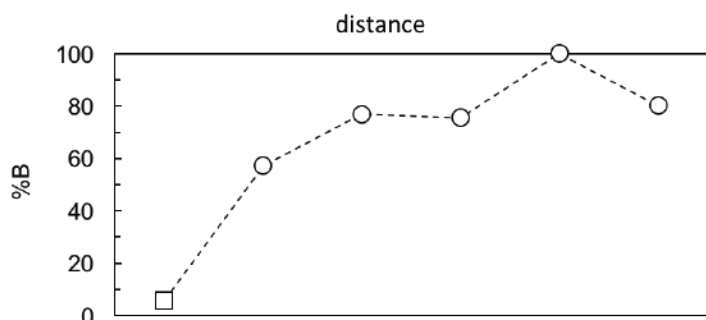
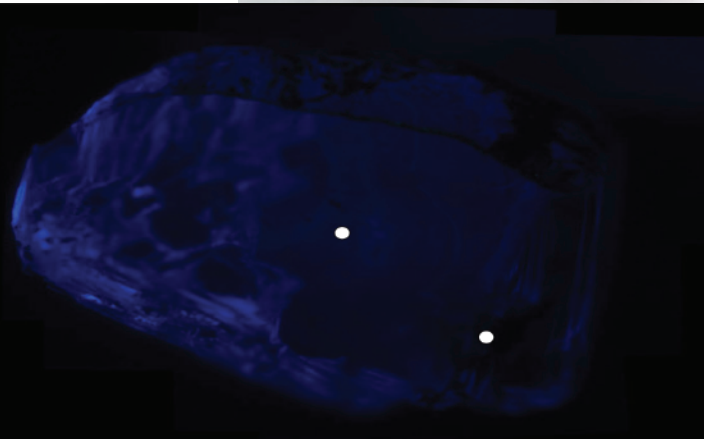
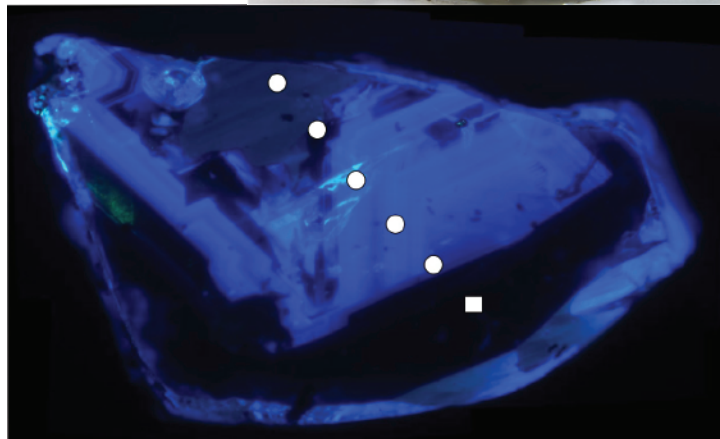
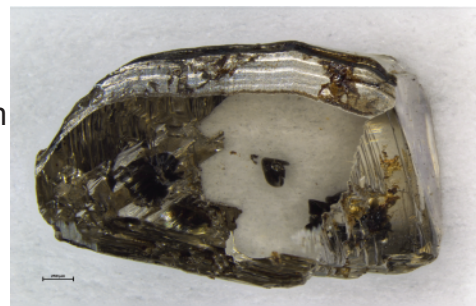
JW398

group: C1
aperture: 50 μ m



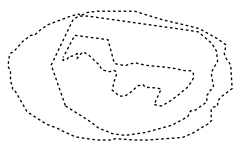
JW407

group: C1
aperture: 100 μ m



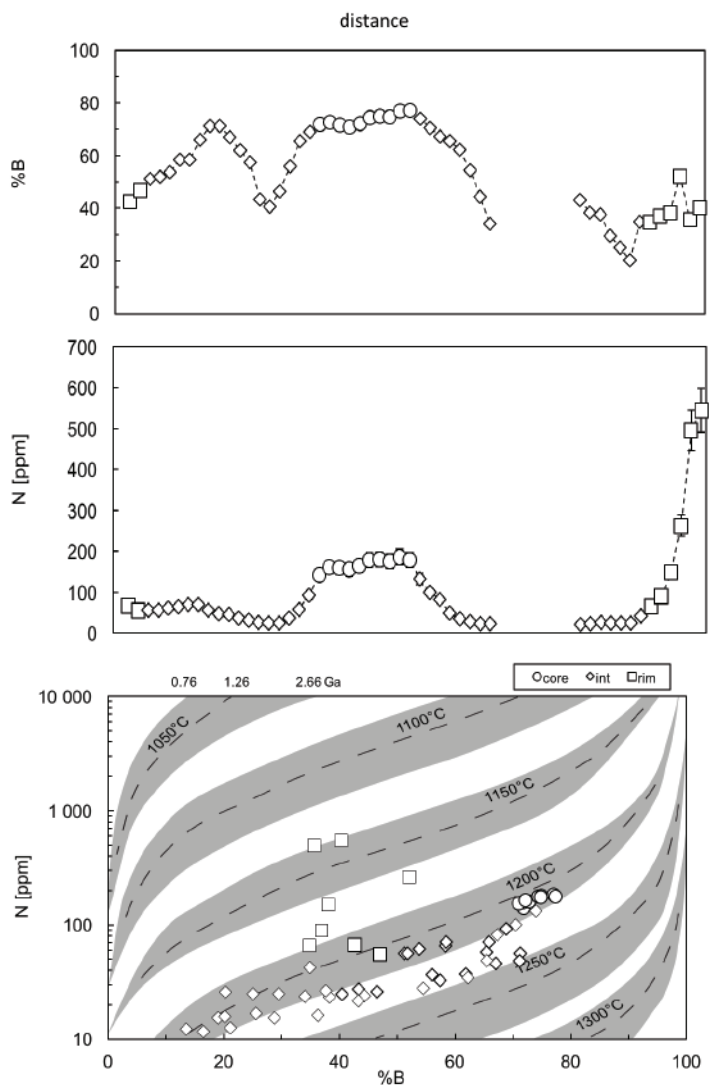
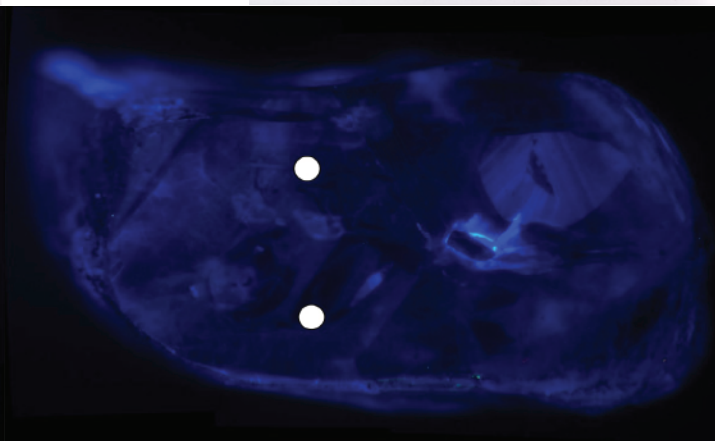
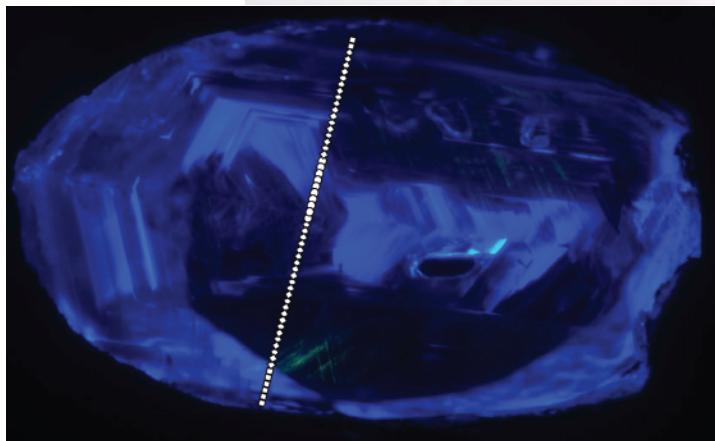
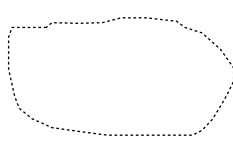
JW411

group: C3
aperture: 50μm

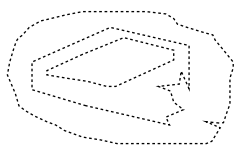


JW445

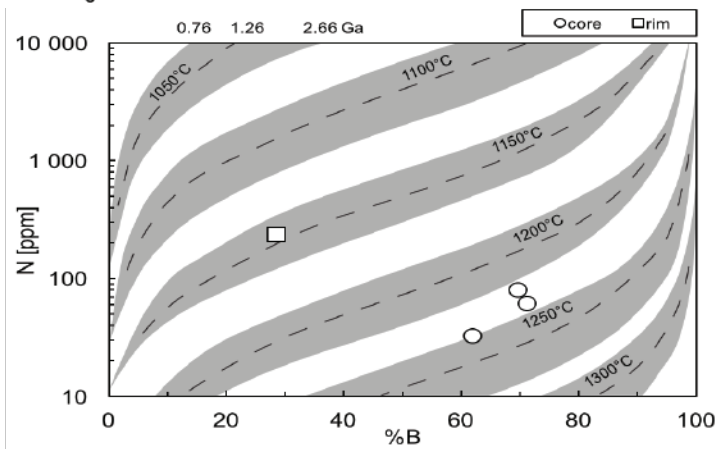
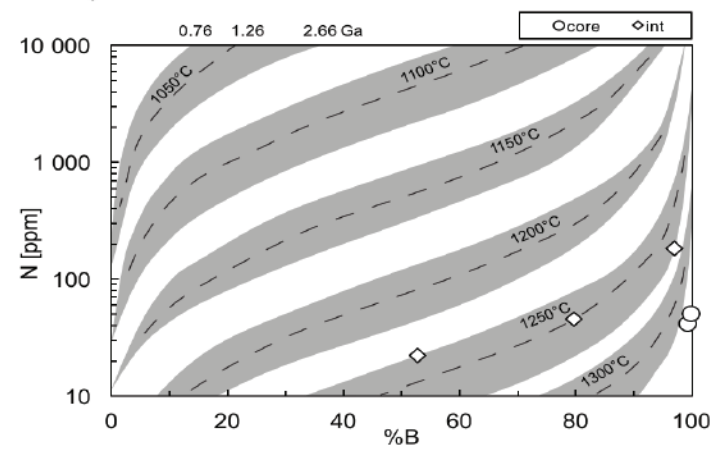
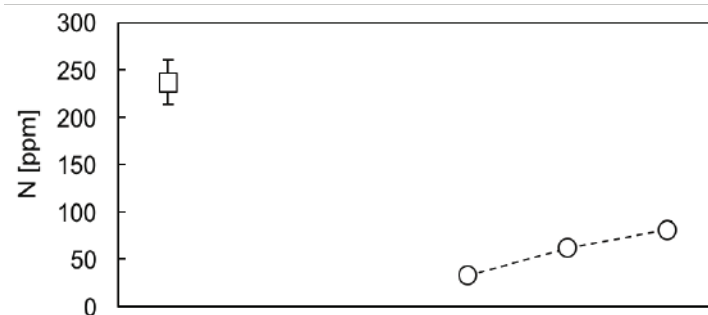
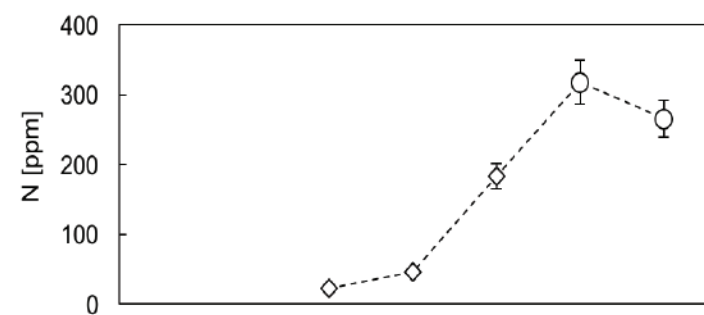
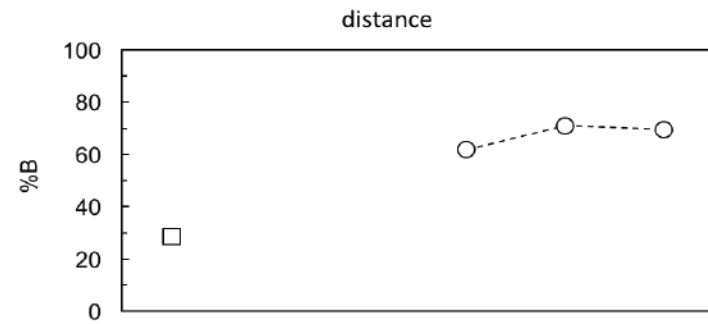
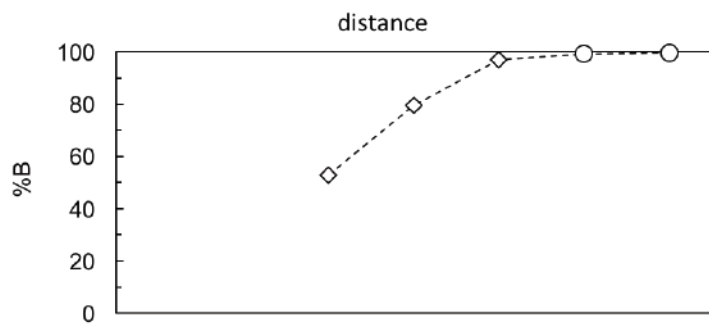
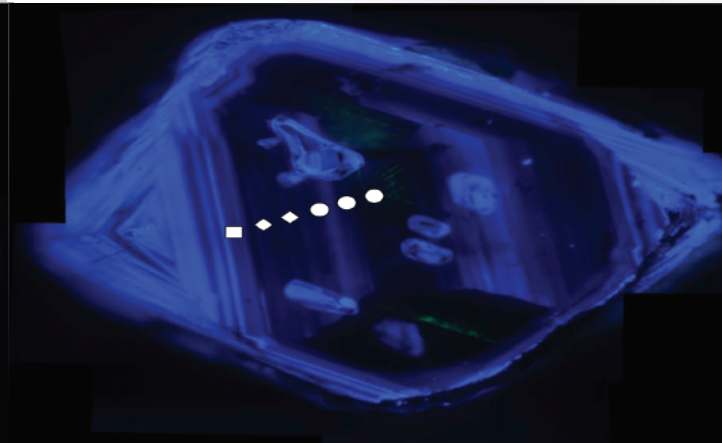
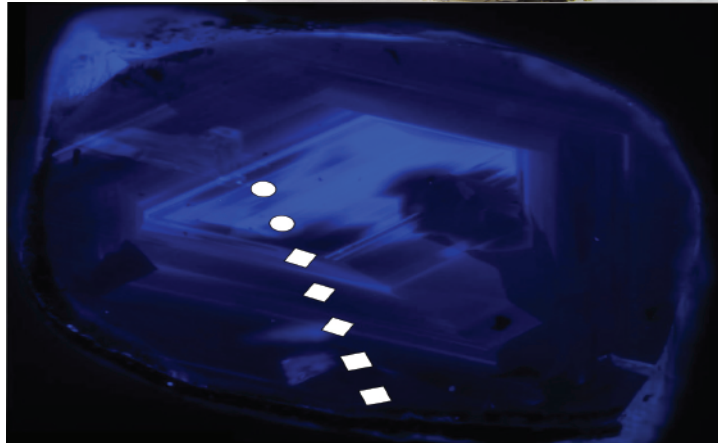
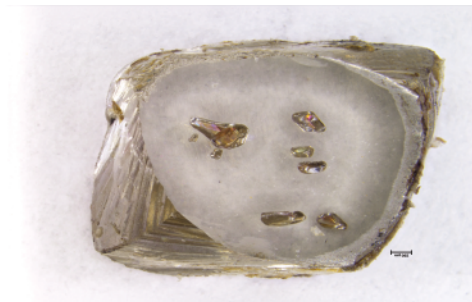
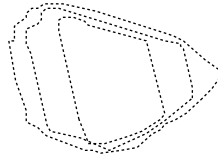
group: A
aperture: 100μm



JW448
group: C2
aperture: 50 μ m



JW450
group: C3
aperture: 100 μ m



JW455
 group: C2
 aperture: 100 μ m

