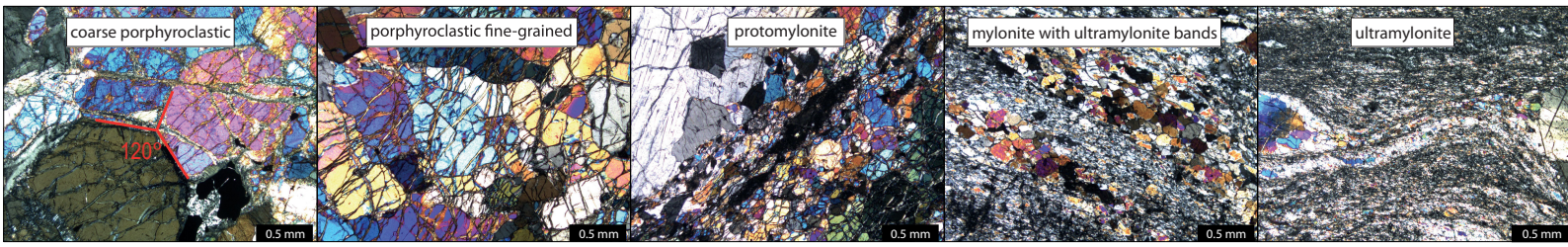
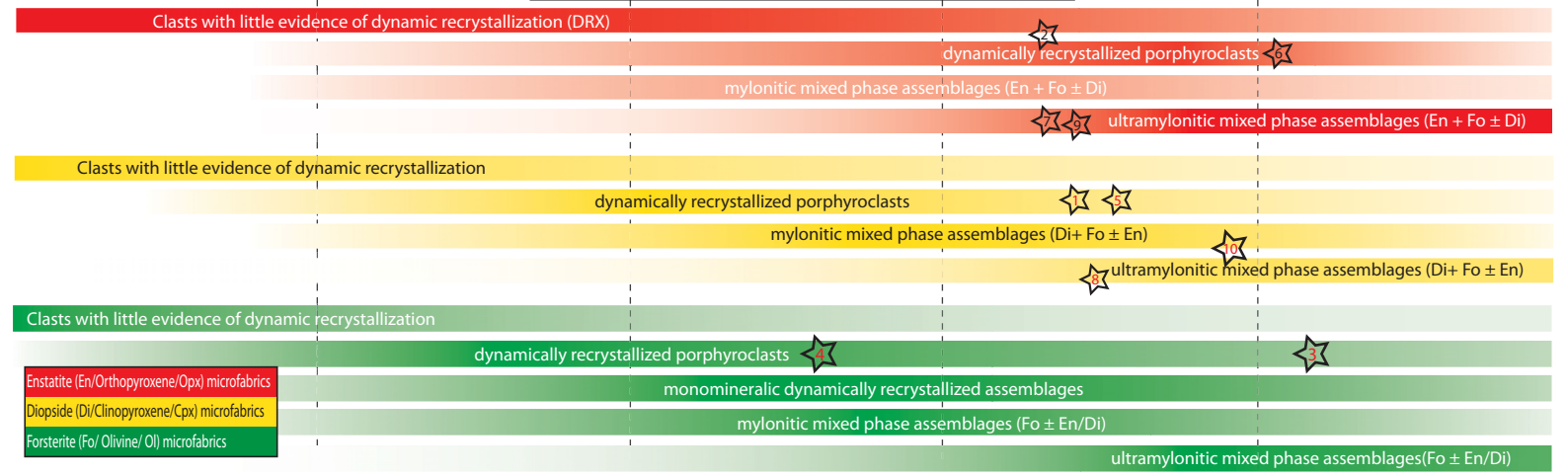
PHASE MIXING IN UPPER MANTLE SHEAR ZONES

Olivine nucleation during dynamic recrystallization of opx and cpx porphyroclasts

Texture Types



Phase-dependent Microfabrics



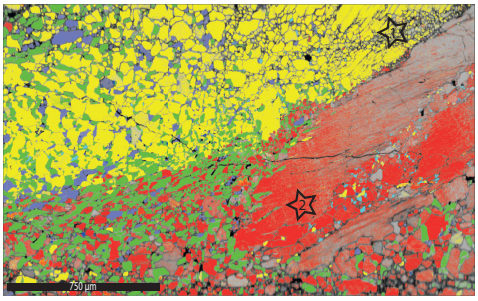


Fig.1 – EBSD phase and band contrast map of DRX Di and En in mylonite.

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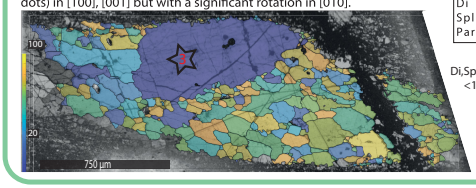
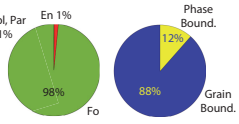
Fig.2 – Misorientation map of DRX Fo porphyroclast (3) in ultramylonite texture type. Note the almost monomineralic phase assemblage and the small amount of phase boundaries showing little evidence of phase mixing. Pole figures depict a relatively strong Fo neoblast CPO (J-index 1.8) with orientations similar to host clast (white dots) in [100], [001] but with a significant rotation in [010].



	Ø Equ. Dia. [µm]	Ø Aspect Ratio	Ø Shape Factor
Fo	48	1.65	1.25
En	15	1.66	1.16
Di	14	1.49	1.10
Spl	11	1.74	1.14
Par	16	2.26	1.19



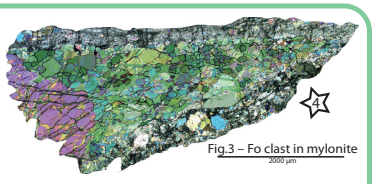
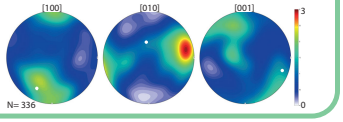


Fig.3 – Fo clast in mylonite



DIOPSIDE

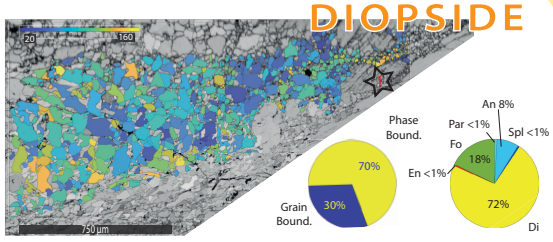
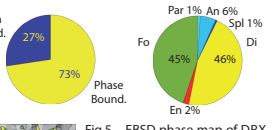


Fig.4 – Misorientation map from DRX Di porphyroclast (1) in texture type mylonite with um-bands (background: band contrast). Phase overview is given in Fig.1. Note the homogeneous misorientation already close to clast leading to a relatively strong CPO of 2.2 (J-Index, ODF not shown). Despite the area-% of Di, small grains of mostly Fo and An lead to a high percentage of phase boundaries.

	Ø Equ. Dia. [µm]	Ø Aspect Ratio	Ø Shape Factor
Fo	15	1.82	1.26
En	11	1.68	1.21
Di	22	1.55	1.25
Spl	8	1.61	1.14
An	14	1.73	1.23
Par	9	1.83	1.23

	Ø Equ. Dia. [µm]	Ø Aspect Ratio	Ø Shape Factor
Fo	9	1.89	1.28
En	8	1.71	1.23
Di	10	1.70	1.27
Spl	4	1.44	1.11
An	11	1.79	1.24
Par	8	1.56	1.17



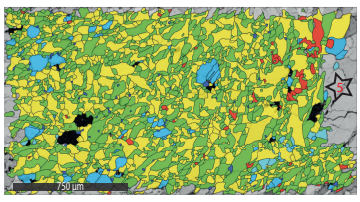


Fig.5 – EBSD phase map of DRX Di porphyroclast (right) (5) in texture type mylonite with um-bands. Notice instant phase mixing of Di+Fo+An and En next to the clast also shown in the high percentage of phase boundaries. Di grain size tends to be slightly bigger than Fo and En grains.

ENSTATITE

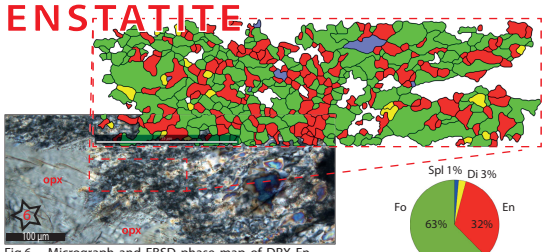
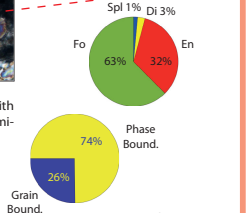
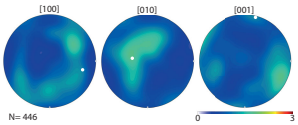
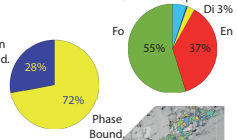


Fig.6 – Micrograph and EBSD phase map of DRX En porphyroclast (left) (6) in texture type mylonite with um-bands. Note instant phase mixing of En with predominantly Fo and the extreme small grain size of neoblasts.

	Ø Equ. Dia. [µm]	Ø Aspect Ratio	Ø Shape Factor
Fo	6	1.81	1.28
En	5	1.51	1.21
Di	4	1.47	1.15
Spl	4	1.62	1.21







	Ø Equ. Dia. [µm]	Ø Aspect Ratio	Ø Shape Factor
Fo	16	1.97	1.31
En	16	1.64	1.27
Di	12	1.83	1.29
Spl	7	1.62	1.14
An	15	1.80	1.26
Par	6	1.89	1.25

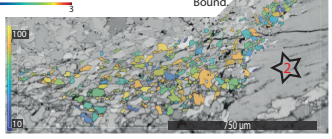


Fig.7 – Misorientation map of DRX En porphyroclast (2) in texture type mylonite with um-bands (background: band contrast, phase overview: Fig.1). Note high mis. angle close to host clast, small grain size and high Fo area-% compared to Di microfabric (1). Pole figures (J-index. 1.3) show similar neoblast and host clast (white dots) orientations in [100], [010] but a rotation in [001].

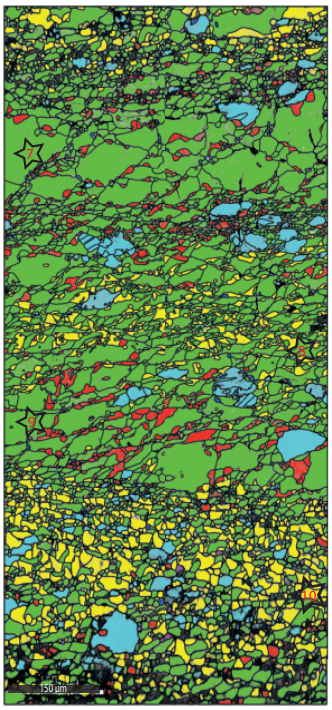


Fig.8 – EBSD phase map of layered ultramylonite band. Note the distinct layers of Fo+En+An (7 & 9) and Di+Fo +An (8 & 10) assemblages and their difference in grain size.

CONCLUSIONS

Phase mixing is simultanous to dynamic recrystallization of Di (Fig.1,4,5) and En (Fig. 1,6,7) porphyroclasts.

Phase mixing is highly depend on Fo neoblast nucleation during dynamic recrystallization (see Fo neoblast close to clasts (Fig.1,5,6).

Fo is the dominant mixing phase. In contrast to Di en En, it shows little phase mixing itself during porphyroclast recrystallization (Fig.2,3).

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