Textures of Geo-materials

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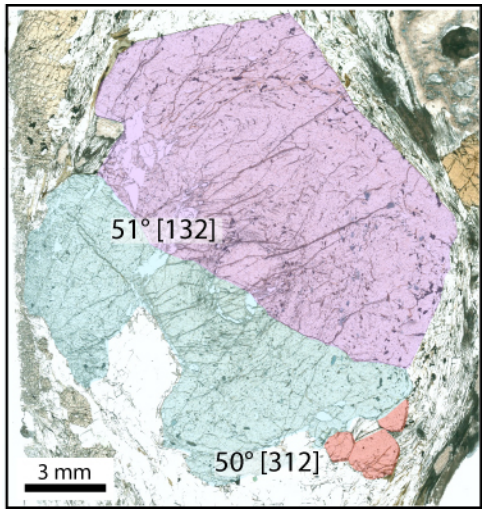
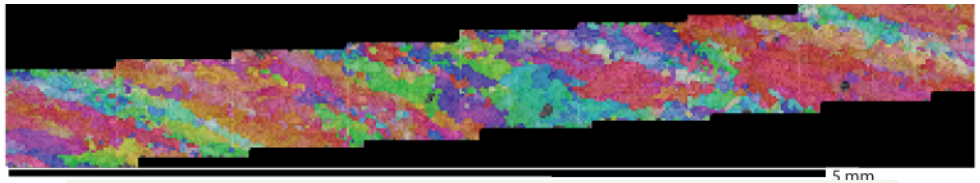
NNIN Facility utilized: Characterization Facility

- Lattice orientation of naturally & experimentally deformed minerals
  - Crystallization mechanisms and conditions of garnet and spinel polycrystals
  - Deformation mechanisms of silicates and carbonates over range of pressure (0.5-2 GPa) - temperature (300-800°C) conditions
  - Mechanisms of recrystallization of high-P textures



Photomicrograph annotated with data obtained by electron backscatter diffraction (EBSD) mapping. Misorientation boundaries are labeled with angle/axis of rotation required to bring the lattices into coincidence.

- MAJOR OBSERVATIONS
  - High-symmetry polycrystals are common in nature owing to chemical & physical heterogeneities (precursor phases; deformation), influencing all later stages of crystallization
  - Columnar calcite is a relict high-pressure texture; initial stages of recrystallization destroy the shape fabric but not the crystallographic preferred orientation of grains



EBSD map of columnar calcite texture from a high-pressure marble

- Publications

- Goergen, E.T., Whitney, D.L., Zimmerman, M.E., Hiraga, T. (2008) Deformation-induced polymorphic transformation: experimental deformation of kyanite, andalusite, and sillimanite. Tectonophysics, 454, 23-35.
- Davis, P.B., Whitney, D.L. (2008) Petrogenesis and structural petrology of high-pressure metabasalt pods, Sivrihisar, Turkey. Contrib Min Petrol, 156, 217-241.
- Whitney, D.L., Goergen, E.T., Ketcham, R.A., Kunze, K. (2008) Formation of garnet polycrystals during metamorphic crystallization. J Met Geol, 26, 365-383.
- Whitney, D.L., Teyssier, C., Kruckenberg, S.C., Morgan, V., Iredale, L. (2008) High-pressure – low-temperature metamorphism of metasedimentary rocks, southern Menderes Massif, western Turkey. Lithos, 101, 218-232.

+ *conference abstracts* (GSA, AGU, EGU)