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Mechanical effects during the exsolution in minerals

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Mineral exsolution is common in minerals. In fact, the majority of petrogenetic minerals are never found in pure form but instead they form solid solutions. When solid solutions cool down, they unmix and they form bands of distinct composition called lamellae (e.g. Fig. 1)[1]. Transmission Electron Microscope observations on such lamellae reveal that the crystal lattice is coherent, i.e. it continues across the lamellae interfaces[2]. The continuity of the lattice requires that the lattice parameters are different from the unstressed case and therefore, the process of mineral unmixing generates stresses on the mineral scale[2]. The latter suggests that the exsolution of solid phases is a strongly coupled chemical-mechanical phenomenon.

This project aims on the development of coupled chemical-mechanical framework for modeling mineral exsolution. More specifically the doctoral candidate is expected to develop numerical models that couple the Cahn-Hilliard with the compressible viscoelastic Navier-Stokes equations.

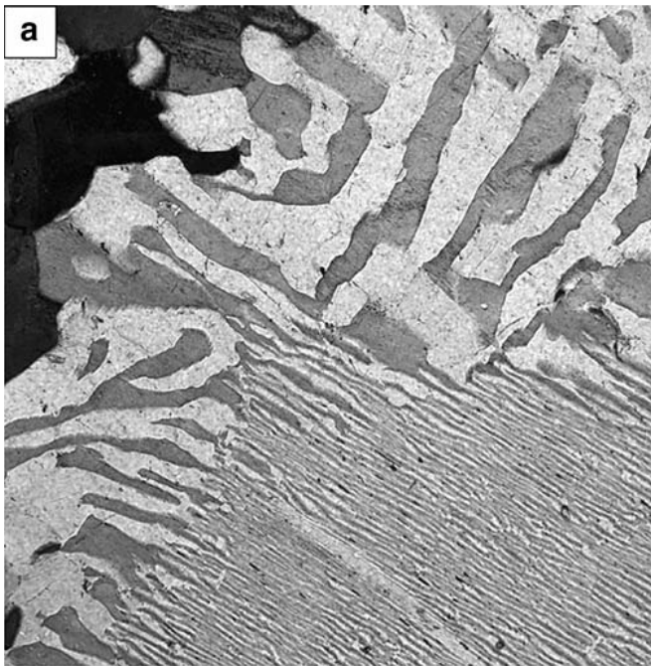

Figure 1. Mineral exsolution in feldspar. The field-of-view of the thin section 1mm. Image taken from [1].

References

1. Kuhl, E. & Schmid, D. W. Computational Modeling of Mineral Unmixing and Growth. *Computational Mechanics* **39**, 439–451 (2007).

2. Robin, P.-Y. F. Stress and Strain in Cryptoperthite Lamellae and the Coherent Solvus of Alkali Feldspars. *American Mineralogist* **59**, 1299–1318 (1974).