3D reconstruction of synthetic crystals and results comparisons

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Experimental samples of basaltic composition, at different temperatures, were created in laboratory [1] and, *in-situ* observations of plagioclase and olivine crystals in this synthetic basalt by using micro-tomography beam lines at SPring-8 were made [2]. This has enabled us to calculate the 3D Cristal Size Distribution (CSD) of those experimental charges. The crystal size distribution law expresses the number of crystals per interval size per unit volume [3, 4]. This physical law is aimed at connecting size, distribution and abundance of crystals in a rock to the thermal history.

Three dimensions crystals resulting from the experimental samples were created. The 3D reconstruction has been conducted using the numerical platform 3DEXPERIENCE © developed by Dassault Systèmes. The modeling is carried out manually by working on successive images of the samples in order to observe all the crystals and to consider how they are spatially organized. As a result, sections of crystals have been drawn and linked together to build the crystal shape in 3D. Size measurements on axes of each modeled plagioclase crystal and volumes measurements were taken. This modeling and calculations have been done for each load of synthetic basalt. Once finished, the plagioclase CSD were calculated for the different temperatures with the major axis data and with the minor axis data.

CSD of this study are compared with calculated CSD from previous experimental studies using others methods: 2D modeling and 3D mathematic conversions [1] or 3D modeling with different software and automatic axis calculations [5]. The results show similar curves with: a decrease in the CSD according to the temperature and comparable slopes.

[1] Pupier *et al.* (2008) *Cont. Min. Pet.* **155**, 555-570. [2] Ottavi-Pupier *et al.* (2013) *Mineralogical Magazine*, **77(5)**, 1902. [3] Marsh (1988) *Cont. Min. Pet.* **99**, 277-291. [4] Higgins (2000) *Am. Min.* **85**, 1105-1116. [5] Duchêne *et al.* (2008) *Am. Min.* **93**, 893-901.