3d modelling of a synthetic basalt: olivine crystals designed by using the 3dexperience© and blob3d© software

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The 3D modelling applied on crystals study provides valuable information about the texture and the crystallization processes of a synthetic basalt.

Therefore this study focuses on the 3D crystals modelling of these sample created from oxides powders in a laboratory, by Pupier et al. (2008). The main objective of this study was to design all olivine crystals within the sample by using both the 3DEXPERIENCE© platform, developed by Dassault Systèmes, and the BLOB3D© software.

Due to the complexity of olivine crystal shapes, the 3D models were performed thanks to new modelling methods adapted on each software. For both software, the modelling methods operated by using the sample X-ray tomographic images which allowed to observe all the crystals within the sample and analyze their shape and their spatial organization.

To this, the BLOB3D© modelling method generated crystals automatically and operated by applying filters on these images. Filters allowed to point out the olivine crystals grayscales proper to each crystal and to directly link them together in order to finally obtain a 3D volume. This modelling methods provided a useful insight of olivine crystals organization within the sample and allowed to better individualize each of them.

In contrast, the 3DEXPERIENCE© software allowed to manually draw the sections of olivine crystals identified on these images, in order to link them together and finally obtain a 3D volume. It turned out that this modelling method provided accurate values regarding the crystal measurements realized on the sample mainly thanks to the manual modelling which is more precise.

So the 3D modelling provides an ideal insight of the whole sample with crystals organization and interaction within the sample while assessing the representativity of crystal shapes. The crystals axes and volumes measurements can be used to calculate the Cristal Size Distribution (CSD), crystallinity and connectivity values on both software modelling. The results obtained by using the 3D methods are then compared with each other and with other results from basaltic crystal studies in order to assess the relevance of all informations they can provide about the sample.

Key words: 3D modelling ; crystals ; synthetic basalt ; olivine ; 3DEXPERIENCE© ; BLOB3D© ; crystal shapes; crystallinity ; connectivity ; CSD ; comparisons.

References

Pupier, E., Duchene, S., et Toplis, M. J., 2008. Experimental quantification of plagioclase crystal size distribution during cooling of a basaltic liquid. Contributions to Mineralogy and Petrology, 155(5), 555–570.