Sanidine megacrystals from the Quarternary volcanic field of the Eifel, Germany

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Sanidine megacrystals weighing up to 10 kg are found at several eruption centers of the Quaternary Eifel volcanic fields, Germany. The origin of these highly perfect sanidine megacrystals with unusual physical properties is poorly understood [1]. In order to shed light into their formation the chemical composition and structural features of both the host crystal and various types of inclusions have been studied employing a combination of different methods. For example, the arrangement, shape, size and internal microstructure of inclusions were studied with polarization and scanning electron microscopy, chemical composition of solids were investigated using electron microprobe analyses, EDX and cathodoluminescence, composition and density of fluid phases by microthermometry.

Two generations of inclusions can be roughly distinguished. The first generation (I) has been trapped during crystal growth and thus provide an insight into environment and conditions of crystallization. First generation inclusions can be divided in two major types. Type A consists usually of single crystals of apatite, pyroxene, biotite, titanite, zircon, pyrochlore and nosean with well developed crystal morphology, whereas type B contains solids (minerals and/or glass) together with a fluid phase. With respect to the fluid filling microthermometric analysis allows subdivision into four groups. Group I-B1 shows melting of ice at temperatures in the range from –9 °C to –2 °C. In group I-B2 dissociation of clathrate is observed at temperatures between +6 °C and +15 °C indicating the presence of CO_2. Group I-B3 inclusions contain CO_2 and H_2O as separate phases at room temperature. In group I-B4 no phase transitions can be observed. Inclusions of the second generation (II) are significantly larger (up to several millimetres in diameter) and contain mainly a silicate glass phase. They formed at a later stage probably during a reinjection of fresh melt and provide information on the processes which eventually lead to eruption.

[1] Zeipert, C., Wondratschek, H., 1981. Ein ungewöhnliches Temperverhalten bei Sanidinen von Volkesfeld/Eifel. *N. Jb. Mineral*, Mh.**9**, 407-415