グラニュライト相ー超高温変成作用下で包有されたナノ花崗岩類中のハロゲンについて

Halogens in nanogranitoids entrapped during granulite facies to ultrahigh-temperature metamorphism in the lower crust

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Granulite facies to ultrahigh-temperature (UHT) metamorphic terranes in the deep crust are considered as a potential source region of granitoid melts that eventually form plutons (e.g., Sawyer et al., 2011; Brown et al., 2011). Melt inclusions such as “nanogranitoids” and “felsite inclusions” recently found from such granulite facies and UHT metamorphic terranes are the explicit evidence of partial melting (Cesare et al., 2009; 2015; Hiroi et al., 2014). Such inclusions enable us to estimate the melt composition formed by partial melting (Cesare et al., 2015) and to estimate the timing of partial melting when combined with pressure-temperature-time (*P-T-t*) paths (Kawakami et al., 2013; 2016).

In determining the melt compositions using nanogranitoids, re-melting and re-homogenization of nanogranitoid inclusions using piston cylinder is often performed, and nanogranitoids with decrepitation texture are avoided from such experiments (Cesare et al., 2015). However, nanogranitoids that has decrepitation texture are common in high-*T* pelitic gneisses (e.g., Hiroi et al., 2014; Cesare et al., 2015; Kawakami et al., 2016) and if development of such texture is related to the *P-T* path of the host rock as in the case of fluid inclusions (Vityk and Bodnar, 1995), neglecting the decrepitated nanogranitoids might mean neglecting of specific metamorphic history. Therefore, efforts in determining chemical compositions of melt inclusions of decrepitated nanogranitoid inclusions is also valuable. Among various chemical aspects, information on major halogens (F and Cl) in lower crustal nanogranitoids is extremely poor (e.g., Cesare et al., 2015; Acosta-Vigil et al., 2016; Ferrero et al., 2018). This study aims to provide some new data on the halogen contents in nanogranitoids to better understand the partial melting in the granulite facies active lower crust using fully crystallized nanogranitoids.

Nanogranitoid inclusions are found as inclusions in garnet from granulite facies mafic and pelitic gneisses from Balchenfjella (Sør Rondane Mountains, East Antarctica). Mineral assemblages of the large-sized (>100 μm) nanogranitoid inclusions are Bt + Pl + Qtz in mafic gneiss, and Bt + Pl + Qtz + And + Sil in pelitic gneiss. Mesoperthite in the nanogranitoid inclusion and in the matrix of the pelitic gneiss gave temperature of >900 ºC based on ternary feldspar thermometry. These observation evidences that Balchenfjella experienced UHT metamorphism and the nanogranitoid inclusions represent the UHT melt. The re-integrated composition of nanogranitoids range from granodioritic in the mafic gneiss to granitic in the pelitic gneiss, and mostly peraluminous. The peraluminous melt compositions might be a result of post-entrapment interaction between the melt and host garnet. F/Cl ratio of biotite in the nanogranitoids can be an indicator of F/Cl of the nanogranitoid melts, and low F/Cl ratio observed in this study contrasts with high values observed in peraluminous silicic melts from intrusive and extrusive igneous rocks. This suggests that F/Cl ratio in shallower level silicic igneous rocks is mainly controlled by the magmatic processes in the shallow crust, and chemical characteristics of source rocks or F/Cl ratio of the original melts in the source region is of secondary importance.

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