

Fluid inclusion study on the Unidirectional Solidification Textures in Highly Differentiated Granitic Rocks at Kharaatyagaan, Central Mongolia

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UST-bearing aplite body is recognized in the Neoproterozoic highly differentiated granitic rocks at Kharaatyagaan. Litho-geochemical prospecting result shows well determined anomalies of gold, tungsten and molybdenum mineralization in the area. Based on the field work relationship between the aplite and host rock, the UST is considered to have formed along the roof of a small aplite intrusion. The UST-bearing aplite is characterized by sequence of three main textural units: (i) thin crenulate UST layers, (ii) thick UST layers and (iii) fine-grained aplite units. Scanning electron microscopy and cathodoluminescence (SEM-CL) imaging of UST quartz from the Kharaatyagaan revealed a history of crystal growth, exhibited by four types quartz; Euhedral quartz phenocrysts with well developed concentric growth zoning (Qa1) in the aplite unit, euhedral quartz with weak growth zoning in the aplite unit (Qa2), UST quartz exhibiting distinct growth zones (Qu1), UST quartz showing mosaic texture (Qu2). Differences in textures of quartz in SEM-CL image are predominantly caused by variations in the Ti contents of quartz. UST quartz crystallization temperatures were calculated by Ti-in-quartz geothermometer (TitaniQ). TitaniQ crystallization temperatures of Qu1 quartz range between around 500°-710°C and Qu2 quartz range between around 490°-560°C; gradually decreased from bottom to top of the Kharaatyagaan hill, whereas, Qa1 crystallization temperatures range between about 540°-780°C and Qa2 crystallization temperatures range between about 540°-630°C. Fluid inclusions study in UST quartz from Kharaatyagaan mainly consists of CO₂ free and polyphase fluid inclusions. The homogenization temperature of the part A and part B UST quartz from 120-550°C with 1-10wt. % NaCl equivalent and mostly occurs CO₂-bearing fluid inclusions. The UST quartz from part C homogenization temperature range 140-400°C with 0.1-18wt. %. NaCl equivalent and mostly occurs two phase fluid inclusions. The result of studies on UST-bearing aplite demonstrates an evidence for two main stages of crystallization at Kharaatyagaan. (1) Quartz phenocrysts representing the early stage of magma differentiation, exhibited by Ti-enriched quartz phenocrysts (Qa1) and UST-quartz (Qu1) and homogenization temperature high and low salinity CO₂-bearing fluid inclusions in part A. Consequently, vapor rich and CO₂-bearing fluid inclusions are significant evidence of magmatic derived fluids and of a phase separation sign during early-stage of the Kharaatyagaan UST-bearing aplite body in part A.