Physical conditions and magmatic processes by crystal size distributions in the granitoids from the Byarjomand Batholith, north-central Iran

K. Kazemi¹, A. Kananian¹, F. Sarjoughian²

¹-Department of Geology, College of Science, University of Tehran, Tehran, Iran
²-Department of Earth Sciences, Faculty of Sciences, University of Kurdistan, Sanandaj, Iran

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Abstract: The Byarjomand Batholith with Pre-cambrian age in the north Semnan, north-central Iran, consists of granite, granodiorite, quartz monzodiorite and gabbrodiorite. These rocks have granular texture and occasionally granophyric, perite and poicilitic textures. Crystal size distribution (CSD) studies can reveal magmatic processes. In order to determine volumetric proportion, growth time and nucleation rate of feldspar crystals and magma crystallization rate, feldspar crystals from 8 samples of granite, granodiorite and quartz monzodiorite rocks have been studied to quantitative analysis by JMicrovision and CSD Corrections softwares and then the results of the analysis of various samples were compared together. The calculated volumetric proportion indicates that percent of these minerals vary from 10.95 (in quartz monzodiorite) to 39.2 (in granites). According to growth rate (10⁻¹⁰ mm/s) and CSD graphs slope (-3.93 - -6.88), samples have grown in different time ranges, and growth time in the granodiorite and granites is more than quartz monzodiorite as growth time procure 54.29 to 81.93 years in granite rocks and 46.08 years in quartz monzodiorite rocks. Also nucleation rate in quartz monzodiorite is maximum and granites and granodiorite have minimum amounts. So crystal presence in the granodiorite and granites are larger than crystals of quartz monzodiorites and it is compatible with petrographic observations and indicates the important of different physical conditions prevailing in the magma solidification. In the some of the frequency distribution curves observed fractures and curvature that is due to contamination and magma mixing and fractionation process.

Keywords: Byarjomand, granitoide, CSD, volumetric proportion, nucleation rate

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* Corresponding author, Tel: (021) 61112493, Fax: (021) 66491623, Email: Kazem.kazemii@ut.ac.ir