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Biotite Composition from Mashhad Granitoids, NE, Iran

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Mashhad granitoids consist mainly of tonalite, granodiorite and monzogranite. These rocks were geochronologically and petrologically grouped into G1 and G2 granites. The Triassic tonalite and granodiorite are grouped as G1 and the Jurassic monzogranite as G2 granites. One of the most distinctive petrographic features of each rock type is the difference in the pleochroic colors of its biotite. Biotite in tonalite is greenish brown to green pleochroic, in granodiorite is light brown to dark brown and in monzogranite light brown to deep reddish-brown. The oxidation state of iron determined by wet chemistry shows that Fe3+/(Fe2++ Fe3+) ratio in reddish brown biotite is 0.10 indicating relatively reducing whereas in brown and green ones is 0.18 and 0.23 suggesting more oxidizing conditions. Similarly, the most outstanding compositional characteristics of these biotite specimens are their differences in total Al contents and in Fe/(Fe+Mg) ratios, both features regarded as sensitive indicators of conditions prevailed in the host magmas. In the annite-sidrophylite-phlogopite-eastonite (ASPE) quadrilateral used to plot the composition of trioctahedral micas based on the above parameters, biotite samples from G1 and G2 granites define two distinct and non-overlapping trends. Each trend is characterized by a relatively narrow Fe/(Fe+Mg) values and a pronounced trend of increasing total Al. This trend is relatively common and observed in biotite from several locations worldwide and attributed to considerable contributions from reduced aluminous supracrustal material, either by assimilation or anatexis.
Keywords: Biotite, granitoids, oxygen fugacity, Mashhad, Iran