Nature of biotite and muscovite in the Yuksipryong two mica granite

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The Yuksipyong granite contains two micas, and range in compositon from medium- to coarse-grained equigranular leucocratic granite to granodiorite. They belong to peraluminous granite, having biotites and primary muscovites as aluminous minerals. It has an average FeO*/MgO ratio of 3.7 and MgO 6-7wt%, which are in accordance with those from other peraluminous magma. But Biotite has the low ratio of Mg/(Fe+Mg) content with average 0.37 and low Al contents comparing with siderophyllitic biotites in typical other two mica peraluminous suites. It contains substantial octahedral site vacancies which occur by substitution of $3M^{2+VI} \Leftrightarrow 2Al^{VI}, \square^{VI}$, these vacancies result in the lower temperature crystallization compared with ideal trioctahedral biotite-eastonite compositions.

On the basis of petrographic observation, the muscovite in Yuksipryong two mica granitic rocks can be classified into six types: (1) occurring as intergrowth with or across biotite filling the interstices or as overgrowing of another mineral, (2) as euhedral crystals including small biotite, and (3) as single euhedral to subhedral crystal without inclusions, (4) as subhedral crystal occuring within plagioclase, (5) as lath-shape muscovite occuring in the center, along two directions of twin or parallel to zonal structure within plagioclase and (6) as single large subhedral crystal in pegmatitic dyke. According to the result of textural evidences under the microscope and chemical analysis of muscovite, Type 1, 2, 3, and 4 belong to primary muscovite and type 5 and 6 to late-post magmatic muscovite. But no one type is predominant in studied area. Thus muscovite in Yuksipyong granite is mostly primary muscovite that has magmatic origin. Primary muscovite contains significantly high Ti and Mg, and low Al contents in composition compared with those from late to post magmatic muscovite. However, the content of Na and Si show wide variations in all types. Muscovite shows celadonite or Tschermark's substitutions: $R^{3+} + Al^{IV} = Si + R^{2+}$ (R^{3+}=Al, Fe and R^{2+}=Mg, Mn), which govern the muscovite composition. It is likely that this composition of muscovite are more stable at high temperature than pure muscovite, which temperature is corresponding to crystallization temperature range of biotite and plagioclase substitution. When we consider from the ratio of Mg/(Mg+Fe) of biotite and primary muscovite with celadonitic composition in micas dehydration melting curve, We conclude that micas are crystallized between 3.7kbar, 650℃ and 7-8kbar, 700℃.