Rb-Sr Mineral Ages of Mesozoic Granitic Rocks in the Goesan-Eumseong Area : Implications for Rb and Sr Diffusion during Cooling

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1. Introduction

Generally mineral ages can be interpreted as the time elapsed since the arrival of the closure temperature of minerals by cooling and reheating. This property has been used for investigating the cooling history of intrusive rocks or the thermal events after the intrusion. In case of Rb-Sr system, however, the mineral-whole rock isochron could be misinterpreted in the meaning of the age calculated. This is, basically, related to the degree of homogeneity in the initial Sr isotope composition between whole rock and minerals or mineral themselves. This problem might be serious in plutonic rocks whose cooling rate is too slow that Sr isotope compositions between whole rock and minerals are largely different during cooling.

This article discusses the geological meaning of the whole rock-mineral Rb-Sr ages of Mesozoic granitic rocks in the Goesan-Eumseong area, Chung Cheong Buk-Do.

2 General Geology

The granitic rocks in the study area can be primarily divided into biotite granite, K-feldspar megacryst-bearing biotite granite, and granodiorite (hereafter, these rocks will be called as BGR, KBGR, GD, respectively). The BGR is the most voluminous rock in the study area, which intrudes into Precambrian gneisses in the north-western part, and the Ogcheon metasedimentary rocks in the east. The BGR also intrudes into the KBGR in the Eumseong area.

The KBGR is distributed in the western part of the study area. In the north of the Eumseong area, the KBGR is intruded by the BGR. In the western part of the batholith, the KBGR contacts unconformably with Cretaceous sedimentary rocks and intrudes into the Precambrian gneiss. Characteristically, the KBGR has K-feldspar megacrysts, 2~7cm in size, which are generally randomly distributed. In the western margin, however, the KBGR is strongly foliated and K-feldspar megacrysts are

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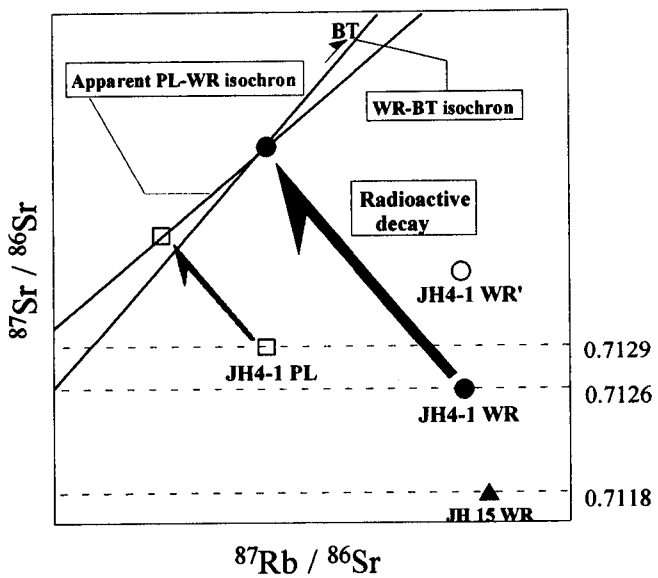
elongated to the direction of foliation (N46~52°W, 42°SW).

The GD is mainly distributed in the Goesan area, being intruded by the BGR to the north. The relationship between the KBGR and the GD is not well known, because no contact between them is revealed in the field.

3 Results and Discussion

The samples JH4-1 and JH 15 are the representative specimens from the GD and the BGR, respectively. Their Rb-Sr isotopic ratios are analyzed by TIMS (model VG 54-30) in Korea Basic Science Institute.

$^{87}Sr/^{86}Sr$ and $^{87}Rb/^{86}Sr$ ratios of biotites from JH4-1 and JH15 are much higher than those of whole rock and plagioclase. In JH4-1 sample, $^{87}Sr/^{86}Sr$ and $^{87}Rb/^{86}Sr$ ratios of plagioclase are distinguishably lower than whole rock. In JH15, however, these ratios show little difference from those of whole rock.



The sequence of Rb-Sr mineral ages and ranges of initial $^{87}Sr/^{86}Sr$ ratios of minerals in the GD can not be explained by a simple cooling history, but can be reasonably interpreted by the effect of a later thermal event. The residual part of the GD whole rock except plagioclase significantly exchanged Sr isotopic composition with outside of the whole rock during the thermal event. Therefore the temperature of the thermal event which reheated the GD should be below the closure temperature of plagioclase (ca. 550°C). The thermal event is thought to occur at 142 Ma or older based upon whole rock-biotite isochron of the GD. The thermal event which affected Sr isotopic composition of the GD might be the intrusion of the BGR. Rb-Sr biotite age of the BGR (114 Ma) is regarded as a cooling age.