

Study of zircons structures from the Miocene Shibi-san Granodiorite, Kagoshima Prefecture, Japan

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The Miocene granodiorite body (zircon fission track age by Miyachi, 1985) of the Mount Shibi, Kagoshima prefecture is a lenticular stock that intrudes the Cretaceous sedimentary rocks of the Shimanto belt. Previous studies subdivided the granodiorite body into the Kusu-bae (core facies) and Hira-bae (marginal facies) types based on the changes in litho-facies and distinct chemical composition of biotite and amphibole (Yamamoto et al., 1988). We conducted field survey in the study area and found no clear contrasts to sub-divide the body, instead it represents a single pluton with local chemical variation along the marginal portions. Based on detailed petrography, the entire body appears as homogeneous stock exhibiting identical mineral assemblage with no clear evidence that can mark the boundary between Kusu-bae and Hira-bae types. Moreover, to understand the processes of magmatic crystallization we investigated more than 600 zircon grains from about 8 samples for external (applying the zircon morphology method of Pupin, 1980) and internal morphology using the Cathodoluminescence imaging. Based on the Pupin's method, the deduced temperature range for the zircon crystallization was between 750 and 850°C. In addition, internal structures of zircon (CL images) showed oscillatory zoning with continuous growth domains and abundant apatite inclusions, suggesting the magma was fluid-rich and have been crystallized under relatively higher temperature. We also investigated zircons from the surrounding hornfels (Shimanto belt rocks) that were affected thermally due to the contact metamorphism. Zircons from the hornfels are completely different and rounded with different internal structures. Zircons from the so-called Kusu-bae and Hira-bae types are identical and suggest their crystallization from a single parental magma hence the pluton cannot be sub divisible.

References

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