

Intensity of gamma ray and geological conditions

Motohiko Shibayama[1]; Koichi Nakagawa[2]

[1] Geosciences, Osaka City Univ.; [2] Geosci., Osaka City Univ.

To clarify the relation between Gamma-ray dose rate and geological material, I measured Gamma ray in all parts of Osaka-fu and Nara-ken where various geological materials are distributed. As a result, the following facts were made clear:

1. The mean value of the whole gamma-ray dose rate was the same as the one of Japan.
2. The average value of sedimentary rocks or metamorphic rocks was the same as the one of Japan, but as compared with by geological zone, there was difference.
3. In pluton, especially there was remarkable difference at Gamma-ray dose rate according to the rock type.

It was found that when the SiO₂ weight pasentage increases, the Gamma-ray dose rate gets bigger. It was also found that there is a strong relation between the Gamma ray dose rate and Anorthite content in the plagioclase.

I measured the gamma-ray dose rate on 4 plutonic rock bodies, in Osaka and Nara Prefectures (Ibaraki granitic complex, Shijyonawate granodioritet, Katsuragi quartz diorite, Ikoma gabbro). As a result, the Gamma-ray dose rate was perfectly consistent with the zoned structure of pluton. These zoned plutons have common features that U, Th, 40K are increasing from circumference to the center.

Based on that U, Th, 40K are closely related to the gamma ray dose rate of plutonic rocks that are made from later crystallization and not crystallization process of magma, I think U, Th, 40K are contained in accessory mineral, e.g., Zircon in igneous rocks, etc.

For this reason, I consider that Gamma-ray dose rate difference is depending on how much this accessory mineral is contained in sedimentary rocks or metamorphic rocks except igneous rocks.