

Thermoluminescence dating of calcite: Application to calcite vein deposited from groundwater in Luzon, Philippines

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Advantages of calcite thermoluminescence dating are (1) effective range of dating is from thousands to one million, suitable to quaternary research, and (2) the radioelement in sample is not necessary, therefore applicable to variety of materials. Thus, thermoluminescence dating can be applied to calcite as well as ¹⁴C dating and/or uranium disequilibrium. TL dating has been applied to various calcites, for example, inorganic carbonates such as limestone and stalagmite, and biogenic calcite such as shell, coral and snail plate. However, thermoluminescence dating of calcite is sometimes problematic; e.g., sensitivity change occurred through repeated heating of samples, difference in characteristics of luminescence response against different kinds of radiation (e.g., alpha-ray, beta-ray, gamma-ray and X-ray). This study applied TL dating to calcite vein deposited from high alkaline groundwater originated probably from the serpentinization of mafic rocks in Luzon, Philippines. High alkaline groundwater has been circulating along cracks in a rock and bentonite layers. Age of calcite contribute to determine the timescale of fluid-bentonite interaction in a geological framework, which is an important knowledge for a deep geological repository of radioactive wastes, for bentonite plays an important role to prevent an outflow of the contaminated groundwater to the environment.

For paleodose measurement, SARA (single-aliquot regeneration and added dose) method was applied to evaluate sensitivity change of calcite occurred through repeating heating of samples. To know the difference in characteristics of luminescence response against different kinds of radiation, we measured thermoluminescence of sample induced by alpha-ray, beta-ray, gamma-ray and X-ray, and the ages of calcites were calculated with these results.

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