Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SGL42-04 Room:419 Time:April 29 10:00-10:15

Thermoluminescence property of calcite

OGATA, Manabu[1*] ; HASEBE, Noriko[1] ; FUKUSHI, Keisuke[1] ; FUJII, Naoki[2] ; SATO, Tsutomu[3] ; ITO, Kazumi[4]

[1]Kanazawa University, [2]RWMC, [3]Hokkaido University, [4]AIST

In earth science, the date of past event is very important. To determine accurate age, we have to select suitable dating method for an analyzed sample.

Thermoluminescence dating method calculates a date from equivalent dose estimated by emitted luminescence when mineral is heated. Thermoluminescence dating has been often applied to carbonate minerals because it emits strong luminescence and wider age range applicable than C14 dating method is an advantage of thermoluminescence dating.

However, thermoluminescence dating of calcite is sometimes problematic; e.g., sensitivity change of calcite occurred through repeated heating of samples, possible anomalous fading, difference in characteristics of luminescence response against different kinds of radiation (e.g., gamma-ray, beta-ray, alpha-ray, and x-ray), and so on.

In this study, calcite from Philippine, Mongol, and synthetic calcite are analysed to understand luminescence characteristics of calcite. Mgnesite is also analyzed to see the effect of chemistry. Luminescence was detected by Photon Multiplier (R649, HMA-MATSU) with filter of 600-650nm. Chemical composition, especially impurity concentration was measured by LA-ICP-MS.

First, we evaluate X-ray induced thermoluminescence property of each sample.

Second, we measured luminescence caused by alpha-ray, beta-ray and gamma-ray and compare it to the luminescence induced by the x-ray. .

Finally, the relationship between luminescence characteristics (namely a-x-value, b-x-value and c-x-value) and impurity concentration is examined.

As a result;

1. Most calcites have thermoluminescence peak at 80 and 230 degrees Celsius.
2. In thermoluminescence peak of calcite at 80 degrees Celsius, fading is detected, while at 230 degrees peak is stable.
3. Results show negative or positive relationship between luminescence efficiency factors (a-x-value, b-x-value and c-x-value) and Mg, Mn, Fe and Sr concentrations.
4. The concentration of Fe has a correlation with a luminescence emitting efficiency.

Fe plays an important role for thermoluminescence of calcite. Thermoluminescence property of calcite may be subject to multiple chemical factors (ex; Mg, Mn and Sr), therefore, further analyses on calcites with the variety of impurity is necessary to evaluate a relation between multiple impurity concentration and thermuluminescence properties quantitatively.

Keywords: thermoluminescence, calcite, dating