

# **ESR Dating of barite: Applications to tectonic activities in Nankai Trough and to the activities in sea-floor hydrothermal areas in Higashi-Aogashima region**

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We have collaborated on two projects:

## (A) Timing of the underground hot fluid flow at the Nankai Subduction Zone

It has been discovered that ~200 °C hot fluid flowed through the sediment of the Nankai Subduction Zone off Muroto (Tsang et al., 2020). Such fluid flow can be associated with seismic events or subducting ridges. It is essential to know the timing of the fluid events to put the fluid flow into a geological context and understand the thermal development at the Nankai Subduction Zone. Precipitating from the hot fluid were barite minerals (BaSO<sub>4</sub>) which can be dated using electron spin resonance (ESR) dating at the Institute of Paleontology and Geochronology;

## (B) Formation of the Higashi-Aogashima Knoll Caldera hydrothermal field

The Higashi-Aogashima Knoll Caldera hydrothermal field was newly discovered in 2015 and found to contain an economical concentration of gold. There are emerging studies aiming to understand the formation of this hydrothermal field and the formation age of the field will serve as a piece of key information. At the Institute of Paleontology and Geochronology, I use the barite minerals extracted from the sulfide mounds of the hydrothermal field to find out the formation age.

## Summary of work at the OUS over the past year

At the Institute of Paleontology and Geochronology (Toyoda Lab), I extracted barite in the Chemistry laboratory, conducted ESR dating using the ESR spectrometer, and measured the background radiation of samples using the low-background gamma-ray spectrometer. Dr. Toyoda and his students gave me helpful comments, ideas and technical support.

## Research progress

The above projects are still ongoing and expected to complete in 2023. Barite samples for both projects are undergoing the last few rounds of gamma-ray irradiation. After irradiation and the subsequent measurements of ESR signals at the Institute of Paleontology and Geochronology, the formation ages will be calculated.

## Current finding

We have confirmed that the barite samples we extracted for both projects (A) and (B) can be used for ESR dating. The implication is twofold; first, the formation ages of the Nankai hot-fluid barite and the Higashima-Aogashima Knoll Caldera hydrothermal field are not older than the Quaternary (i.e., < 2.58 million years old); second, for barite in sediment at the Nankai Subduction Zone in particular, ESR signals in barite have not been significantly reset even though the barite is hosted in ~100 °C sediments. Results on testing the thermal stability of barite for ESR dating, which were obtained at the Institute of Paleontology and Geochronology, have been published in a paper in Quaternary Geochronology.