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SGL041-07 Room:203 Time:May 25 10:00-10:15

3D subtraction imaging and U, Th concentration measurement of single grain of zircon

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(U-Th)/He age is calculated from helium content in a crystal generated by alpha decay. Alpha particles, nuclei of helium, are emitted with high kinetic energies and typically require about 20 micrometers to stop within zircon. These long stopping distances partly cause helium loss from near surface zone in the crystal and underestimation of (U-Th)/He age. This effect is corrected from the size and shape of crystals at present, called ”alpha correction”. Although this correction assumes a homogeneous distribution of decay precursor, it is not always appropriate, especially in zircon.

Therefore we need to measure 3D distribution of U and Th in the crystal for more accurate alpha correction before (U-Th)/He dating, and the measurement have to be performed without destruction of the crystal for following (U-Th)/He method. 3D subtraction imaging of micro X-ray computed tomography is one of such methods. However, a high-flux source is required for this application because a bulk zircon crystal absorbs/scatters X-rays. In this study, we tried to take the images of ten grains using a micro X-ray computed tomography facility in the large synchrotron radiation facility ”SPring-8”. At the result, we succeeded to detect a 3D varied distribution without destruction of the crystal. We also measured concentrations of U and Th using laser ablation ICP-MS in some of the crystals to investigate the sensitivity or detection limit of subtraction imaging of U and Th in zircon, and the effect for (U-Th)/He age.

Keywords: zircon, micro CT, subtraction imaging, (U-Th)/He dating