# Development of U–Pb and REE analyses of uraninite using an ion microprobe

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Chronology of uraninite has been used in a large number of scientific studies to provide new constraints on different aspects, such as the origin of uranium deposits, the safe disposal of radioactive wastes, and the indicator of atmospheric oxygen evolution. The chronological studies of uraninites have been carried out by applying Pb isotopic dating, chemical dating, and U–Pb isotopic dating. Because uraninite often shows complex chemical texture clue to multistage mineralization and alteration, the advantage of microanalysis, which enables us to make measurements on the scale of a few micrometers to tens of micrometers, becomes important. In this study, we established a method for the U-Pb isotopic analysis and rare earth element analysis of uraninite in a similar manner to the conventional zircon analysis using a sensitive high-resolution ion microprobe (SHRIMP-IIe).

A uraninite sample ($^{206}Pb/^{238}U$ = 0.1647) collected from Faraday mine; Bancroft, Canada, is used as a reference material for the U–Pb calibration and REE abundance. Quantitative analysis of major elements was carried out by EPMA. The homogeneity of Pb/U ratio and REE abundance was checked by ICP-MS. Three uranium minerals collected from Chardon, Ecarpière (the Armoricain Massif, France) and Mistamisk (Labador, Canada) were analyzed to compare the Faraday mine uranite. The U-Pb and REE analyses of the uraninite samples were performed by using SHRIMP.

The correlation between the calibrated SHRIMP $^{206}Pb^*/^{238}U$ ratios of three uraninite samples, obtained from the Chardon, Ecarpière, and Mistamisk mines, and the Pb/U elemental ratios obtained using EPMA (correlation coefficients: 0.98, 0.99, and 0.97, respectively) indicates the reliability of the SHRIMP calibration method used in this study.