Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SGL041-06 Room:203 Time:May 25 09:45-10:00

Merits of LA-ICP-MS U-Pb zircon dating method: From two case studies

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LA-ICP-MS has an advantage of inexpensive, simple and quick technique to obtain U-Pb ages over conventional TIMS and SIMS (SHRIMP) techniques. It also has a merit to obtain fission-track ages using the same zircons prepared for U-Pb dating and vice versa. Here, two case studies are presented using LA-ICP-MS equipped with 193 nm excimer laser in Kanazawa Univ.

As zircon U-Pb method has a closure temperature of as high as ~1000 degree C, it is useful to estimate the crystallization age of granitic magmas. As for the Ryoke granite in Awaji Island, a K-Ar hornblende age of 87.7 Ma had been the age of the highest closure temperature (~500 degree C). A newly obtained LA-ICP-MS U-Pb zircon age of 87.6 Ma could further constrain the crystallization age of the granite and also helped to reveal the entire cooling history of the granite from crystallization age to the present. As for granitic xenoliths from clastic dykes in Matsukawa geothermal area, Iwate Prefecture, a LA-ICP-MS U-Pb zircon age of 1.30 Ma was obtained. Because the zircons were previously dated as 1.0 Ma by the fission-track method (closure temperature: ~240 degree C), the crystallization age of the granite was constrained ranging from 1.3 to 1.0 Ma. The U-Pb age was better in quality than the fission-track age in that individual grain U-Pb ages were more uniform than individual fission-track ages. This demonstrates that LA-ICP-MS can easily yield reliable U-Pb zircon ages as young as 1 Ma and promises a bright future for this method.

Keywords: LA-ICP-MS, U-Pb dating, zircon, granite, Quaternary