

Thin section etching of zircon for micro thermochronology by fission track method: A trial

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Zircon is a mineral commonly used for fission track dating. However, since it is an accessory mineral, it is generally used for analysis after the mineral separation. With the conventional methods, rocks are crushed and important information on the mineral occurrence is lost. If we could develop etching method of zircon in the thin sections, the interaction between coexisting minerals, the relationship between zircon occurrence and its age can be studied. Thin section dating could contribute micro thermochronology on samples with potential paleotemperature difference among a narrow zone, e.g., a fault gouge, an archeological vase, or archeological furnace sites, etc. The analyses without Teflon sheet mounting, which sometimes suffer electrostatic disturbance, may be useful for observation by, for example, AFM or SEM. To avoid the destruction of a thin section during the etching by high temperature alkali eutectic etchant, pinpoint etching only on zircon was tried. In order to perform pinpoint etching, a pipette tip made of polypropylene or Teflon was tried, but dropping of the etchant on the sample was impossible, because of the rapid solidification during the experiment. Dropping the etchant using a Teflon coated spoon on a sample was possible, but the control in amount of etchant was difficult. A photosetting resin was used as a material for bonding the rock and the slide glass. As a result of trial with several etchants, it was found that rocks came off with an etching solution at 160°C or higher. The KOH:NaOH eutectic mixture used in the conventional zircon fission track method was found to be unsuitable because it had a melting point of about 170°C. On the other hand, the KOH:NaOH:LiOH eutectic mixture used as an alternative etchant has a melting point of about 140°C and has higher etching efficiency than the KOH:NaOH eutectic mixture. Zircon in thin section was able to be etched using a KOH:NaOH:LiOH eutectic mixture at 150°C.

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