

Zircon observation by atomic force microscope: Fission track or alpha recoil track?

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Fission track (FT) method is a dating technique based on the observation of damage (tracks) by spontaneous fission of ²³⁸U left in a mineral. The number of tracks is counted under an optical microscope after etching (chemical expansion of a track). However, as FT density per unit area rises, it becomes difficult to count the number of tracks. This is due to the fact that FTs overlap one another and are unable to be readily distinguished. The atomic force microscope has a potential to observe FT with high track density after a short time etching. However, when etching time is too short, the number of counted tracks were increased probably due to difficulties in recognizing the FT among structures other than FT (e.g., alpha recoil tracks). In the observation of young zircons collected from modern volcanic product, the surface structures found in old zircons do not exist, and a hole with the depth of ~10nm can be found on the smooth surface. These countable holes may lead us to the alpha recoil track dating.

Keywords: zircon, fission track, alpha recoil track, atomic force microscope