

40Ar/39Ar thin section dating using automatic XYZ stage controller

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Combining automatic XYZ stage controller with a Nd-YAG pulse laser, an automatic 40Ar/39Ar thin section dating system has been developed. The stage controller has a spatial resolution of 0.5 micrometers, and the systems resolution is solely dependent on that of Nd-YAG lasers. The laser spot has a minimum diameter of 50 micrometers or better, but holes formed on a thin section are normally larger. The effective spatial resolution is about 100 micrometers. The size of the crater and the amount of debris vary with the thickness of the sections, and strongly dependent on the light absorption rate against the beam and thermal properties of target minerals.

A sample of 100 micrometers and 100 micrometer diameter weighs 2 micrograms, and the 36Ar is normally 10-15ccSTP or less. However, the momentum released is large enough to move a thin section as the alignment of the section (400 micrograms) was often destroyed. It is desirable to use nothing to fix a thin section in ultrahigh vacuum. Two metal (titanium or stainless steel) were adopted to sandwich thin sections. This will reserve some free space to release the momentum in the other side of the section during the irradiation of the beam.

The small amount of 36Ar requires high sensitivity of a mass spectrometer. Balance between statistics and sensitivity will be discussed.