PROBLEMS IN THE CHARGE ASSIGNMENT TO FOSSIL COSMIC RAY ION TRACKS IN LUNAR MINERALS. W. Krätschmer and W. Gentner, Max-Planck-Institut für Kernphysik, 69 Heidelberg, Germany, P.O. Box 103980

In our previous studies the lengths of tracks generated by artificially accelerated 10 MeV/n Fe ions in lunar pyroxenes were compared directly with those of fossil tracks of cosmic rays. Relative to the abundance of fossil Fe tracks many of the investigated samples showed a comparable amount of shorter tracks, which would according to their mean length correspond to ions in the Cr region (1).

To reinvestigate this unexpected result, a modified etching technique has been developed which allows one to identify the track forming ions by measuring their track etching rate as function of residual range (2). By this procedure the difficulties, inherent in the track lengths method, can be eliminated. This technique of ion identification has been successfully applied on tracks in feldspars and pyroxenes, opening the possibility to crosscheck the track data obtained in samples containing both minerals.

In order to improve the knowledge about track etching kinematics, tracks of artificially accelerated 10 MeV/n Fe, Co and Cu ions in terrestrial and meteoritic feldspars, pyroxenes and olivines have been studied (see Fig. 1). The results show that for a proper charge assignment the following effects have to be considered: (a) The relation between track etching rate and residual range for a given ion depends noticeably on the orientation of the track with respect to the crystallographic directions (see Fig. 2). (b) The etching process along the ion track proceeds in a discontinuous manner; this effect is more pronounced in minerals having a high ratio between track- and bulk etching rate (yielding small cone angles). The fluctuations of the track etching rate affect the charge resolution of the mineral detectors appreciably. If one corrects for crystallographic effects, the resolution of pyroxenes and feldspars (etched in NaOH solution) is about 2 charge units, for olivines (etched in WN solution) the resolution is about 3 charge units.

Using this newly developed technique, a simultaneous comparison of 10 MeV/n Fe and cosmic ray tracks in feldspars and pyroxenes of rock 15076, 75035 and 71055 is being carried out and the results are presented.

REFERENCES
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Figure 1: Track etching rate as function of residual range measured on tracks of artificially accelerated $10 \text{ MeV/n}$ heavy ions in terrestrial diopside.

Figure 2: The track etching rate-residual range function measured on $10 \text{ MeV/n}$ Co ion tracks having different directions within a diopside crystal.