

UV Laserprobe Ar/Ar Dating of Pseudotachylites

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The ages of pseudotachylite veins and large-scale pseudotachylite breccias are a means to establishing the timing of ancient seismic activity. They are commonly a complex mix of friction melt (ultra)cataclasites and undeformed host-rock clasts which presents considerable problems for radiometric dating: strong isotopic disequilibrium brought about by the heterogeneity of the material compounded by the rapidity with which they formed.

A number of published studies have assessed the differences between bulk, furnace or laser Ar-Ar step-heating, and/or Rb-Sr microsampling and laserprobe Ar-Ar spot dating [1,2,3]. The ultraviolet (UV) laserprobe is the highest spatial resolution method for extracting argon and as such is a valuable tool for assessing the distribution of Ar isotopes in such strongly heterogeneous materials as pseudotachylites. Further, it affords the opportunity to assess the isotopic contribution of entrained host-rock minerals and clasts in the friction melt matrix, and also the loss- or uptake of argon in minerals within the adjacent host-rocks.

Pseudotachylite veins from the Gairloch Shear Zone in the Lewisian of mainland Scotland, and veins and breccias thought to be associated with the Outer Hebrides Fault Zone (Scotland) are used to highlight the kind of information on the timing and process of pseudotachylite formation that can be gained from applying a detailed UV laserprobe approach to such complex materials.

References

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