

Fission track dating of natural and man-made glasses: calibration and problems

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Some of the early work on fission track dating was done on natural glasses, and some pioneering work on mid-ocean ridge basalts was done at Dalhousie by F. Aumento two decades ago. Fission track dating is the method of determining the age of geological materials using the natural property of the ^{238}U isotope to decay by spontaneous fission. This action produces damage in the solid surrounding the uranium (contained in solid solution), called a fission track, which can be made visible by etching a polished surface of the solid. Much smaller tracks are formed by alpha radiation (alpha tracks), and their counting has been used effectively in environmental and exploration studies, but are not generally used for dating. Natural glasses do often contain sufficient amounts of uranium (about $20\mu\text{g/g}$) to be countable and thus yield an age. Therefore, fission track dating has found applications in Archaeology and Quaternary Geology, generally through dating tephra or some man-made glasses (a uranium-glass date of 150 years is reported in the

literature), but more often by dating other minerals (e.g., zircon) in the sample as well. Unfortunately, tracks in natural and man-made glass are unstable and undergo annealing (fading) over geological time, even at relatively low temperatures, and despite new methods devised to correct ages for this effect, fission track dates of glass alone must be considered minimum ages. Another problem encountered is a very low uranium concentration which has produced very few tracks over the age of the sample (normal man-made glass has concentrations of $1\mu\text{g/g}$).

This project attempts to evaluate different glasses of varied compositions and ages for their suitability for fission track dating. Image analysis is used to decrease to some extent the time and the subjectivity involved in counting samples with very low density of tracks. Progress in counting, etching, calibration and imaging are presented.