

AGE DETERMINATION OF OBSIDIAN SOURCE SAMPLES FROM NORTH QUEENSLAND AND NEW SOUTH WALES BY MEANS OF THE FISSION TRACK METHOD

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ABSTRACT

The fission track method applied to obsidian samples allows one to determine their geological age by counting etched tracks due to spontaneous fission of Uranium impurities, usually in the ppm-tens of ppm range. Only recently has research in Australian Obsidians started, after the discoveries of both artefacts and geological sources, the latter being located mainly in North Queensland [1] (NQ) and New South Wales [2]. After the pioneering characterization of samples by trace elements analysis performed by David et al.[1], we have undertaken a program to determine their age by means of the fission track method.

Following irradiation at the nuclear reactor of Pavia University (Italy) for measuring the induced fission track density and determining the present Uranium content, we etched the obsidian samples under standard conditions (Hydrofluoric acid 20% at 40°C, 60-120 s) and counted under an optical microscope the fission tracks to obtain, for the NSW samples, the following ages:

AU 101 13.1 Ma

AU 102 10.1 Ma

and the following ones for the NQ samples:

AU 602 31.9 Ma

AU 603 33.2 Ma

AU 662 24.9 Ma

AU 612 37.8 Ma

which exhibited a considerable fading, ranging between 32% for AU612 and 47% for AU662.

Thermal treatment based age corrections have therefore been applied to get the true ages [3]. Due to the considerable age of samples, we found that the generally employed isochronous high temperature treatments (up to 320°C) were not suited to the age correction. Indeed, probably because of intense hydration process, optical quality of

glass after etching followed by high temperature treatment came out to be unacceptable. We therefore decided to use low temperature (140°C) isothermal treatments. The result for AU602 is shown in Fig.1. A plateau is clearly seen with increasing time, this allowing to determine the true age which came out to be:

AU602	86.9 Ma
AU662	85.5 Ma
AU612	92.3 Ma

with an uncertainty of the order of 4%.

To our knowledge, the above are among the older, if not the oldest, obsidian samples ever dated by means of the fission track method.

Efforts are now on the way to correlate such ages with that of obsidian artefacts of archeological interest[1,2], in order to establish their provenance, and to extend the analysis to several (much younger) sources in Papua New Guinea.

References

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