

TEMPERATURE OF FORMATION OF PSEUDOTACHYLITIC IMPACT BRECCIAS, ROTER KAMM CRATER, SW NAMIBIA. David Rajmon, Peter Copeland, Arch. M. Reid, and Jean-François Lavigne, Department of Geosciences, University of Houston, Houston, Texas USA 77204-5503

Introduction: The Roter Kamm impact crater was formed within rocks of the Proterozoic Namaqualand metamorphic complex in SW Namibia at about 3.7 Ma [1,2]. The rim rocks of this 2.5 km diameter structure are locally cut by numerous fine-grained dark veins and dykes, referred to as pseudotachylytes or pseudotachylytic breccias [3,4]. The field relations of these veins are similar to igneous intrusive dikes but there is no other data that favors the hypothesis that they were melted as a result of the impact event [5].

Results: $^{40}\text{Ar}/^{39}\text{Ar}$ analysis has been performed on three K-feldspar-rich concentrates of material from within these veins (Figure 1). The three results are consistent, with all samples exhibiting age "plateaus" over the last 60 to 70% of gas released with ages ranging from 295 to 320 Ma. The form of the age spectra is consistent with a loss event which we can only resolve to be younger than 29 Ma. The ~300 Ma age is younger than the youngest event known to affect these rocks, the late stage of the Damaran orogeny at about 460 Ma [2] and may reflect a previously unrecognized heating event in the late Carboniferous. Comparing the bulk age of these samples with the plateau ages we calculate that the Tertiary heating event induced approximately 5% Ar loss. Assuming typical diffusion behavior for K-feldspar ($E=48\text{kcal/mole}$; $D_0=1000/\text{sec}$) and a duration of the heating event between 1 day and 100 years, we can constrain the maximum contribution of thermally activated diffusion in the release of this Ar. With these assumptions we can estimate the temperature of formation of the veins at between 250 and 400°C. However, some of the Ar loss could be due to mechanical crushing of material attested to by the very fine-grained nature of these rocks and the temperatures above could be overestimates.

Implications: (1) The region around Roter Kamm experienced a moderate thermal event (sub greenschist) during the Carboniferous. (2) The pseudotachylytic breccias from the rim of the Roter Kamm crater [5, 2] were formed by highly localized comminution of the country rocks with injection of rock powders into impact-generated fractures at temperatures of a few hundred degrees during the impact event.

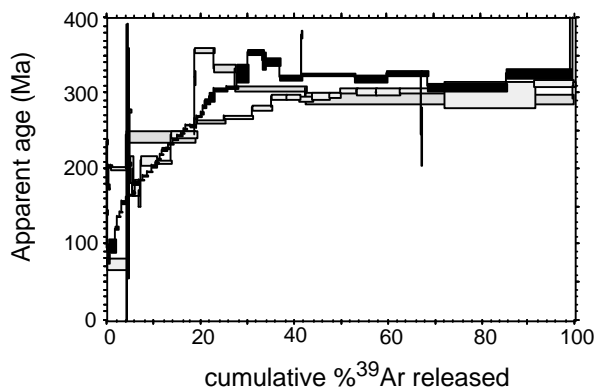


Figure 1. $^{40}\text{Ar}/^{39}\text{Ar}$ release spectra for samples of K-feldspar-rich separates from pseudotachylytic impact breccias of the Roter Kamm crater.

References: [1] Hartung J. B. et al. (1991) *Meteoritics*, 26, 343-343. [2] Koeberl Ch. et al. (1993) *Meteoritics*, 28, 204-212. [3] Miller R. McG. and Reimold W.U. (1986) *Meteoritics*, 21, 456-458. [4] Reimold W.U. (1998) *Earth-Science Rev.*, 43, 25-47. [5] Degenhardt J. J., Jr. et al. (1994) *Geol. Soc. of America, Special Paper*, 293, 197-208