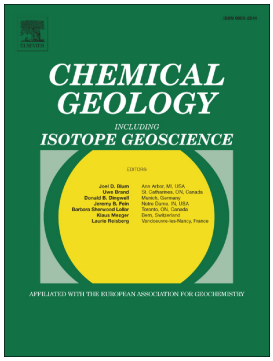
Accepted Manuscript



A new approach for electron microprobe zircon fission track thermochronology

A.N.C. Dias, F. Chemale, C.J. Soares, S. Guedes

PII: S0009-2541(17)30208-5
DOI: doi: 10.1016/j.chemgeo.2017.04.014
Reference: CHEMGE 18317

To appear in: *Chemical Geology*

Received date: 2 January 2017
Revised date: 13 April 2017
Accepted date: 15 April 2017

Please cite this article as: A.N.C. Dias, F. Chemale, C.J. Soares, S. Guedes , A new approach for electron microprobe zircon fission track thermochronology. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Chemge(2017), doi: 10.1016/j.chemgeo.2017.04.014

A NEW APPROACH FOR ELECTRON MICROPROBE ZIRCON FISSION TRACK THERMOCHRONOLOGY

A. N. C. Dias[1], F. Chemale Jr.[2], C. J. Soares [3], S. Guedes[4]

[1] Departamento de Física, Química e Matemática, UFSCar - campus Sorocaba, 18052-780 Sorocaba-SP, Brazil

[2] Programa de Pós-Graduação em Geologia. Universidade do Vale do Rio dos Sinos, 93022-000, São Leopoldo-RS, Brazil

[3] Chronuscamp Research – Thermochronology analysis LTD, 13974-160, Itapira-SP, Brazil

[4] Instituto de Física "Gleb Wataghin", UNICAMP, 13083-859 Campinas-SP, Brazil

Abstract

Fission track thermochronology (FTT) has been applied for decades to quantify rates and timing of processes in the shallow crust. The most widely used approach is the external detector method (EDM). In this conventional approach, an age is obtained by counting both the fossil (^{238}U spontaneous fission) and the induced (^{235}U induced fission) tracks using an optical microscope. The induced tracks are obtained through the irradiation of the sample with thermal neutrons in the nuclear reactor, which causes fission of ^{235}U. Based on the studies carried out by Gombosi et al. (2014), we present an alternative method of dating zircons using electron probe microprobe analysis (EPMA) to measure uranium concentration [U]. The electron microprobe analysis fission track (EPMA-FT) method was applied to three samples of rapidly cooled zircons: the Fish Canyon Tuff, Poços de Caldas (syenite) and Serra Geral zircons. The analyses were performed using two approaches: 1) using the age equation described in Gombosi et al. (2014) and 2) using a new age equation calibration developed for this work. The results using the Gombosi et al. (2014) age equation were 26.7 ± 4.1 Ma, 80.6 ± 12.8 Ma and 130.9 ± 20.1 Ma, respectively, and the results using the age equation from this work were 27.8 ± 1.9 Ma, 83.8 ± 7.7 Ma and 136 ± 12 Ma, respectively. The uncertainty of the age is affected mainly by ^{238}U concentration and ρ_S (the spontaneous fission track density) determinations. Other factors can