

Abstract

Spilitization of Early-Permian Volcanics from Głuszyca Górna (the Intra-Sudetic Basin, Poland) – Constraints from Chlorite Thermometry Coupled with Apatite Fission-Track Dating (AFT) [†]

Tomasz Powolny ^{1,*}, Aneta Anczkiewicz ² and Dumańska-Słowik Magdalena ¹

¹ Faculty of Geology, Geophysics, and Environmental Protection, AGH—University of Science and Technology, 30 Mickiewicza Avenue, 30-059 Krakow, Poland; dumanska@agh.edu.pl

² Institute of Geological Sciences—Polish Academy of Sciences, 1 Senacka St., 31-002 Krakow, Poland; ndstruzi@cyf-kr.edu.pl

* Correspondence: powolny@agh.edu.pl

[†] Presented at the 2nd International Electronic Conference on Mineral Science, 1–15 March 2021; Available online: <https://iecms2021.sciforum.net/>.

Abstract: The Intra-Sudetic Basin, a Late-Paleozoic intramontane trough located on the NE flank of the Bohemian Massif, is comprised of numerous outcrops of continental (extension-related) Early-Permian volcanogenic rocks that are commonly altered to spilites. In this contribution, we provide insights into the formation of spilitized (albite- and chlorite-rich) trachyandesites from the Głuszyca quarry (Lower Silesia, Poland), based on mineralogical and micro-textural investigations supported by apatite fission-track dating (AFT). Our results indicate that the trachyandesites, emplaced as a shallow-level laccolith-type body, have been strongly affected by chloritization of both aegirine and augite, combined with an occasional celadonitization of volcanic glass. Furthermore, chloritization of sodic pyroxenes must have released notable amounts of Na⁺, which could be involved during later pervasive albitization of primary andesine-labradorite. According to various chemical and semi-empirical thermometers, the replacive chlorites formed in the range of 124–170 °C. Trachyandesites from Głuszyca contain abundant fluorapatites, marked by the occurrence of swallow-type terminations, which are indicative of rapid-cooling formation conditions. Central AFT ages of the samples vary between 161–182 Ma and correspond to the Middle-Jurassic period. Meanwhile, these ages are significantly younger than the emplacement of igneous rocks during the Middle-Rotliegendes period (~299–271 Ma). The discrepancy between the stratigraphic age of the rocks and the AFT results cannot be, however, explained by, for example, slow cooling rates of magmatic body, compositional variations of apatite, or burial under Late-Mesozoic sediments. Hence, it may be assumed that the obtained AFT ages (161–182 Ma) reflect the timing of spilitization and associated partial reheating of volcanic rocks from the Intra-Sudetic Basin above the apatite partial annealing zone (70–110 °C).

Keywords: Intra-Sudetic Basin; chlorite thermometry; apatite fission-track dating

Citation: Powolny, T.; Anczkiewicz, A.; Magdalena, D.-S. Spilitization of Early-Permian Volcanics from Głuszyca Górna (the Intra-Sudetic Basin, Poland) – Constraints from Chlorite Thermometry Coupled with Apatite Fission-Track Dating (AFT). *Environ. Sci. Proc.* **2021**, *6*, 3. <https://doi.org/10.3390/iecms2021-09342>

Published: 25 February 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/iecms2021-09342/s1>.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.