On acid oligoclase in vitrophyre from Alftavik, NE-Iceland

Autor(en): **Wenk, E. / Schwander, H. / Stern, W.**

Objekttyp: **Article**

Zeitschrift: **Schweizerische mineralogische und petrographische Mitteilungen = Bulletin suisse de minéralogie et pétrographie**

Band (Jahr): **55 (1975)**

Heft 3

PDF erstellt am: **30.06.2024**

Persistenter Link: https://doi.org/10.5169/seals-43077

Nutzungsbedingungen

Die ETH-Bibliothek ist Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Inhalten der Zeitschriften. Die Rechte liegen in der Regel bei den Herausgebern.
Die auf der Plattform e-periodica veröffentlichten Dokumente stehen für nicht-kommerzielle Zwecke in Lehre und Forschung sowie für die private Nutzung frei zur Verfügung. Einzelne Dateien oder Ausdrucke aus diesem Angebot können zusammen mit diesen Nutzungsbedingungen und den korrekten Herkunftsbezeichnungen weitergegeben werden.
Das Veröffentlichen von Bildern in Print- und Online-Publikationen ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Die systematische Speicherung von Teilen des elektronischen Angebots auf anderen Servern bedarf ebenfalls des schriftlichen Einverständnisses der Rechteinhaber.

Haftungsausschluss

Alle Angaben erfolgen ohne Gewähr für Vollständigkeit oder Richtigkeit. Es wird keine Haftung übernommen für Schäden durch die Verwendung von Informationen aus diesem Online-Angebot oder durch das Fehlen von Informationen. Dies gilt auch für Inhalte Dritter, die über dieses Angebot zugänglich sind.

Ein Dienst der *ETH-Bibliothek*
ETH Zürich, Rämistrasse 101, 8092 Zürich, Schweiz, www.library.ethz.ch

http://www.e-periodica.ch

Schweiz. mineral. petrogr. Mitt. 55, 397–401, 1975

On Acid Oligoclase in Vitrophyre from Alftavik, NE-Iceland

By *E. Wenk, H. Schwander, W. Stern* and *R. Wetzel**)

With 1 figure

Abstract

Oligoclase phenocrysts Or 6 Ab 79 An 15 from the glassy margin (chemical analysis) of a rhyolitic dyke near Ytri Alftavik in NE-Iceland are described. The optic orientation expressed in Euler angles Φ 95.5°, Θ 69.5°, Ψ 84°, $2V_\gamma$ 126.5° fits high-temperature curves of BURRI-PARKER-WENK. Microlites have similar, slightly more calcic composition (An 17–18) and the residual glass is enriched in potassium and approaches proportions near the alkali-feldspar minimum. Similar vitrophyric rocks from E-Iceland, bearing only one type of slightly zoned feldspar, have been discussed by CARMICHAEL (1960, 1963).

The sample described was collected on the easternmost promontory of Ytri Alftavik in NE-Iceland. The rock forms the glassy margin of a rhyolitic dyke in the basaltic pyroclastic series. The locality is of difficult access and was reached following the itinerary described by THORODDSEN (1906, p. 275).

DESCRIPTION OF ROCK ISL 253: PERLITIC OLIGOCLASE-VITROPHYRE

8 vol % phenocrysts of glomero-porphyritic, idiomorphic, well twinned oligoclase An 14–17, up to 2 mm long, with weak zonal structure. 2% phenocrysts of greenish, slightly pleochroic clinopyroxene, $c \wedge n_\gamma$ up to 53°, $2V_\gamma$ 58–60°, $n_\gamma - n_\alpha$ 0.029–0.036, and of Fe-rich olivine, partially or completely replaced by brownish sheet silicates of the chlorite group and of titanomagnetite; zircon is a common accessory.

90% glassy matrix and microlites. Glass brownish, perlitic with incipient devitrification along cracks, n 1.500 ± 0.001. Slightly flow-textured microlites

*) Mineralogisch-Petrographisches Institut der Universität, Bernoullistrasse 30, 4056 Basel.

< 0.1 mm of polysynthetically twinned feldspar, brownish clinopyroxene (pigeonite in part) with small optic axial angle, $n_\gamma - n_\alpha$ 0.029–0.036, axial plane $\perp$ (010) and $\parallel$ (010), and ores. Proportion glass: microlites 6 : 1. Microprobe analyses[1]) proved that three selected feldspar microlites have oligoclase composition:

Or	3.3	4.1	1.8
Ab	78.9	79.0	80.4
An	17.8	16.9	17.8

The composition of the glass is difficult to assess. Compared with the total rock it is enriched in K_2O (3.3 wt-%) and impoverished in Na_2O (3.6–4.0) and CaO (0.3–0.5). Silica and alumina values are not reliable.

The XF-analysis of the total rock gave the following result:

	wt-%
SiO_2	69.8
Al_2O_3	13.0
Fe_2O_3	0.9
FeO	1.9
MnO	0.1
MgO	0.1
CaO	1.3
Na_2O	4.9
K_2O	2.7
TiO_2	0.2
P_2O_5	0.1
H_2O	5.6
sum	100.6

The rock has granitic composition and represents a rhyolitic vitrophyre. From the analysis the norm Q 26.4, Or 17.0, Ab 46.5, An 5.8, M 4.3 (cation-%) is derived.

OPTICAL AND CHEMICAL PROPERTIES OF THE OLIGOCLASE PHENOCRYSTS

Oligoclase is well twinned after the albite-, Karlsbad-, complex albite-Karlsbad- and acline-laws (in order of decreasing frequency). From U-stage measurements on 8 twin-groups the An-range 14–17 resulted and an average optic axial angle $2V_\gamma$ 126.5°. One oft he phenocrysts, composed of 4 individuals proved to be well suited for a detailed study. Repeated measurement gave the following mean Köhler-angles:

[1]) SEMQ-ARL-probe, thin section coated with Au, 15 KV, 20 μA sample current (integrated), $\cong$ 2 sec, beam $\varnothing$ minimal.

	Köhler-angles		
twin-axis	$\alpha\,\alpha'$	$\beta\,\beta'$	$\gamma\,\gamma'$
albite-law	169.5°	164°	19°
Karlsbad-law	138.5°	43.5°	169°
complex albite-Karlsbad-law	43°	139°	165°

From the original data, projected on a WULFF net with diametre 40 cm, the following average Euler-angles were read:

95.5° 69.5° 84°

Independant measurements and constructions by a second operator (A. GLAUSER) on the same twin-group gave the values:

95° 70° 84.5°

Interpreted on the high-temperature curves of BURRI-PARKER-WENK (1967), both sets of data indicate an An-content 14 to 17.

The same twin group was tested on the electron microprobe by serial point analyses in the ranges measured optically. The resulting mean values (in bracket one single higher An value, Ab values by difference) are:

Individual	Or	Ab	An
A	5	79	16 (24)
B	7	81	12
C	6	82	12
D	6	76	18
$\bar{x}_1$	6	79.5	14.5

A neighbouring phenocryst, composed also of 4 individuals, gave a similar average:

$\bar{X}_2$	6	78.5	15.5
accepted mean value	6	79	15

The data for Alftavik oligoclase agree very well with those obtained by I. S. E. CARMICHAEL (1960) for the plagioclase of pitchstone from Bondelfur (F. 8) and by R. SCHEDLER (1971) for samples from Lambadalur, all from the East coast of Iceland, and they fit also those of an oligoclase annealed at high pressure (H. R. WENK, 1969).

	Or	Ab	An	Φ	Θ	Ψ	$2V_\gamma$
Alftavik	6	79	15	95.5°	69.5°	84°	126°
Bondelfur	5.0	78.7	16.3	95.3°	68.7°	84.6°	116°
Lambadalur	7.0	78.8	14.2	91.6°	68.4°	83.6°	–
annealed	4.1	82.4	13.5	95.5°	69.2°	86.8°	128°

Our check shows that there is no need for a revision of the optic curves in the range of acid volcanic oligoclase.

DISCUSSION

In Fig. 1 the projections of feldspar phenocrysts (solid circles), microlites (dots), residual glasses (open circles) and rocks (squares) of vitrophyres from eastern and central Iceland are shown in the ternary feldspar diagram. It gives good information on the variation of the feldspar composition, but ad-

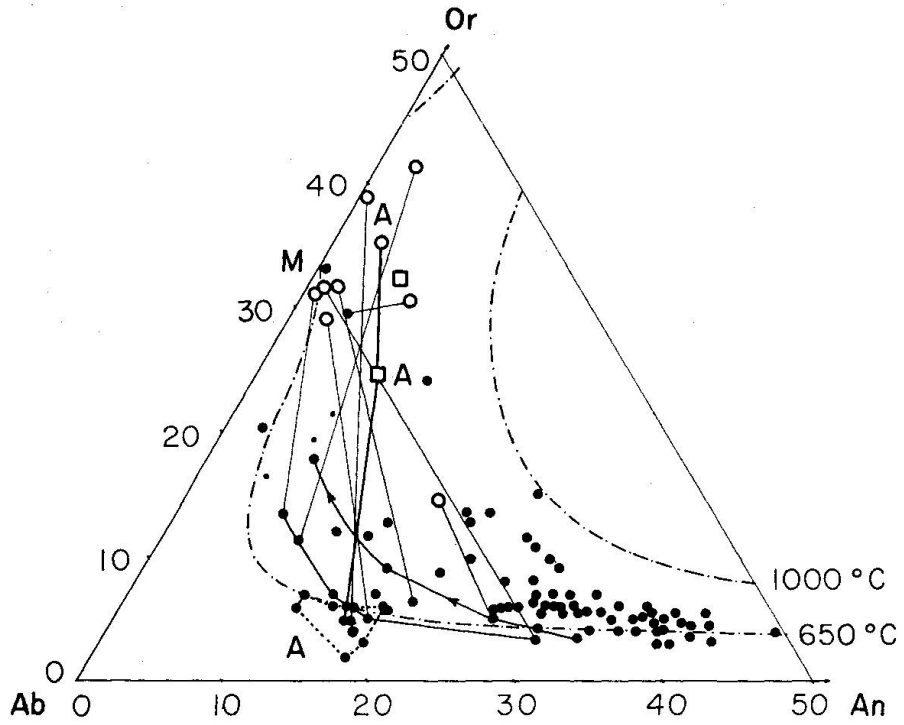

Fig. 1. Ternary feldspar diagram (mol %) showing feldspar phenocrysts (solid circles), microlites (dots), residual glasses (open circles) and rocks (squares) of vitrophyres from eastern and central Iceland. A = Alftavik. Published data from CARMICHAEL (1963, with tie-lines between feldspar and glass), SCHEDLER 1971, WENK et al. 1972. Curve with arrows connects zones observed in one and the same phenocryst from Domadalshraun. Lower curve shows general variation of feldspars studied by CARMICHAEL. Solvus for 1000°C after TUTTLE and BOWEN (1958), for 650°C after SECK (1971).

mittedly, the chemical analysis of residual glasses as well as the calculation of the normative proportion Or Ab An of glasses and vitrophyres are problematic, as the amount of alumina present could be partitioned in different way on K, Na and Ca.

The Alftavik oligoclases are situated within the range of feldspars studied by Carmichael and the residual Alftavik glass projects within the cluster of residual glasses in his diagram, not far from the alkali-feldspar minimum.

Unlike the acid two-feldspar lavas of Domadal in central Iceland, described in a previous paper (WENK et al. 1972), the sodic vitrophyric dyke rock studied here contains only one, slightly zoned feldspar, similar to Icelandic pitchstones discussed by CARMICHAEL (1963). Phenocrysts and microlites have oligoclase composition and the residual glass approaches the alkali-feldspar minimum.

Acknowledgement: We are obliged to A. GLAUSER for the check of optical measurements, to H.-H. KLEIN who drew Fig. 1 and to H. HÄNNI for the preparation of the thin-sections.

REFERENCES

BURRI, C., PARKER, R. L., WENK, E. and WENK, H. R. (1967): Die optische Orientierung der Plagioklase. Birkhäuser, Basel.

CARMICHAEL, I. S. E. (1960): The feldspar phenocrysts of some Tertiary acid glasses. Miner. Mag. 32, 587–608.

— (1963): The crystallization of feldspar in volcanic acid liquids. Quart. J. geol. Soc. Lond. 119, 95–131.

SCHEDLER, R. (1971): Optical, chemical and structural determinations of volcanic, acid Icelandic plagioclase feldspars. Schweiz. mineral. petrogr. Mitt. 51, 463–509.

THORODDSEN, TH. (1906): Island. Peterm. Mitt. Erg.heft, Nr. 153.

WENK, E., SCHWANDER, H. and WETZEL, R. (1972): On a zoned ternary feldspar from Domadalshraun, Iceland. SMPM 52, 373–380.

WENK, H. R. (1969): Annealing of oligoclase at high pressure. Amer. Miner. 54, 95–100.

Manuscript received June 30, 1975.