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ALBITE IN ROCKS OF MIDDLE TRIASSIC SPILLITE-KERATOPHYRE ASSOCIATION OF THE DINARIDS IS LOW-TEMPERATURE, WELL-ORDERED ALBITE

Using the data from feldspar determinations by the Fedorov universal stage method, Pamić reached the conclusion that albite, in rocks of Middle Triassic spilite-keratophyre association of the Dinarids, tends to be the high-temperature one. In his statistical considerations, Pamić has done this arbitrarily and incorrectly. The values of the optical axial angle, as well as the absorption in the IR-spectrum, point to the low temperature albite. Therefore, Pamić's conclusions do not have any petrological significance in considerations and explanations of the primary or secondary origin of sodium and potassium feldspars in the above-mentioned rocks.

I

In 1969 the first report on high-temperature feldspars from Middle Triassic spilite-keratophyre association of the Dinarids was published. From the numerous data of determination of feldspars by the Fedorov universal stage method, Pamić (1969) said in this report that he had been able to statistically determine that the migration curve for the normal to (010) in the Nikitin's quadrant diagram systematically declined to the North. This curve, therefore (see Fediuk, 1961, Fig. 72), nears the migration curve of the high-temperature albite. From the data for the migration curve (001), which are considerably fewer in number, Pamić had achieved similar results. On the contrary, the data for [001] correspond mostly to the curve for low-temperature albite. At the beginning, Pamić's interpretation of these data was a cautious statement, that it did not make possible to come to a definite conclusion regarding the optical character of albite. But, at the end of his paper, Pamić il less cautious when saying that despite the impossibilities of drawing a definite conclusion, his investigations still quite clearly point to the high-temperature form of albite. Thus he thinks that his results can be very useful for petrogenetical considerations and explanations of the primary or secondary origin of sodium and potassium feldspars.

From Pamić's assumptions, if they are based on real premises, the important conclusion would be that in the rocks of the spilite-keratophyre association of the Dinarids, the albite is primary.

Pamić abandoned his initial caution, as mentioned before, in one other respect, too. Up to date, all over the world the investigators of spilite-keratophyre rocks have found that this association, without exception, contains low-temperature albite. According to Pamić, these rocks, in the Dinarids, would be thus the first and, so far, the only exception. Even in Yugoslavia, previous investigators have pointed out low-temperature albite. In several papers on spilite and keratophyre, which were published before 1969, Pamić had not spoken of an albite whose features point to the high temperature form, either. But he has been doing this since 1969. For example, in his paper on the Middle Triassic spilite-keratophyre association in the Dinarids and its position in the alpine magmatic-tectonic cycle, Pamić (1969a, p. 209) pointed out an interesting fact that U-stage measurements by the Fedorov method for albite fall mostly on the curves for high temperature albite. In the same paper, Pamić (1969a, p. 213) speaks about albite phenocrysts which, »sometimes curved and embedded in a groundmass containing albite microlites, suggest the normal course of crystallisation of separate sodium-rich lava«. Then he says »a very important feature is that feldspars show characteristics of the high temperature optics, as well«.

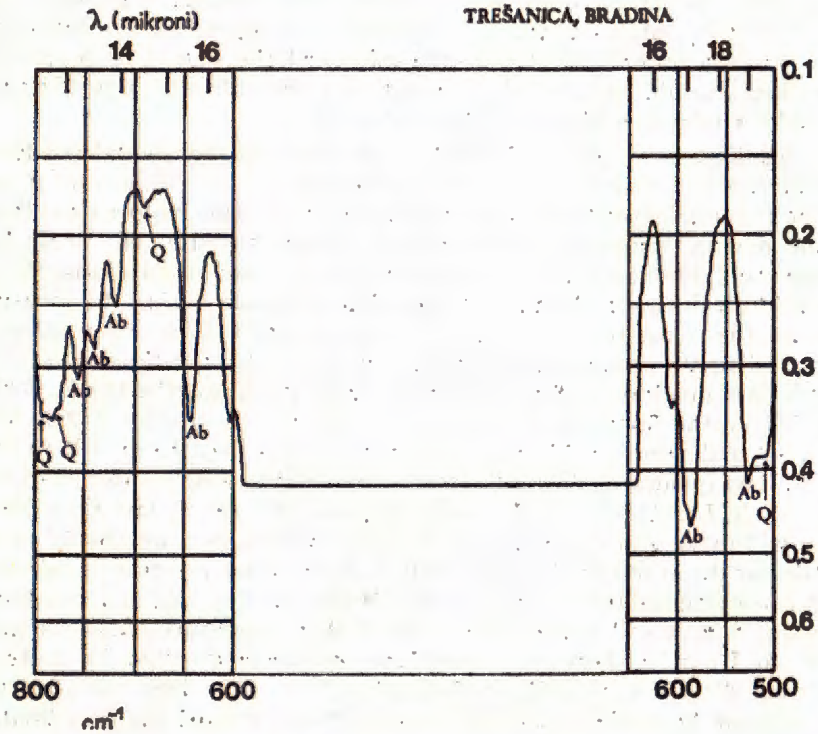
From cautious initial statements, Pamić thus finally speaks of the high-temperature albite, that is, that determinations of feldspars in the Nikitin's quadrant diagram mostly fall on the migration curves for the high-temperature plagioclases. Thereby, Pamić has forgotten that values of the optical axial angle for Ab-rich members of plagioclase series depend very much on whether they are high-temperature or low-temperature plagioclases, that is, particularly, on the degree of order in their crrystal lattice (Tröger, 1967, p. 733). High-temperature albite is optically negative, and the values of the optical axial angle are smaller than —50° (Tröger, 1967, p. 126). The data offered by Pamić (1972, p. 44 and 52), based upon his statistical investigations, however, differ essentially from the just mentioned value of the optical axial angle. Pamić says, that, on the basis of 185 available data for the optical axial angle, he has obtained an average value of $+82^1/_2{}^\circ$, the average composition of albite being approximately 4,2% an. This differs a little, in the sense of increase, from the optical axial angle for low-temperature albite (+78°), as is characteristic for spilites. But, if albites from the spilite-keratophyre association of the Dinarids clearly approach the high-temperature form, i. e. if the results of the Nikitin's quadrant diagram fall mostly on the high temperature curves, as Pamić tries to convince us, then this difference should be considerably greater, that is, the optical axial angle of these albites should be smaller less and its optical sign should be negative.

As regards the above-mentioned average value, it is necessary to say that Pamić achieved it from a few of his own data and a great number of data taken from the other authors, published in numerous papers, which were cited by Pamić in his previously mentioned papers (Pamić 1969a, p. 214–216; 1974, p. 172–174). It should be pointed out, however, that such important conclusions, as Pamić wants to impose to us, require the quantitative chemical analysis of albite from the same rock and its precise U-stage measurement – the U-stage conoscopic measurements should be preferably performed on thicker sections — accompanied by, at least, three geometrically independent elements. In this case determinations of both the value and the sign of each spheric coordinate would be possible. I mentioned this already, reporting on Pamić s mistakes (Barić, 1969 and 1972).

In his discussion, Pamić (1972, p. 58) admitted that he did not have the signs of those coordinates. The signs are particularly important if any of the spherical co-ordinate values nears 0° or 90°. This happens to albite if the measurements are performed by normal to (010). The angle between the ⊥ (010) and the vibration direction X amounts to almost 90° in the acid plagioclases. Because of the mistakes made during the measurements, the values of the ⊥ (010) ∧ X co-ordinate will be dispersed to a certain distance around the migration curve in both the North-East and South-East quadrants of the Nikitin's circle diagram (Fediuk, 1961, Fig. 73). In the South-East quadrant, the coordinate ⊥ (010) ∧ X is less than 90° and negative. If this co-ordinate is measured from +X in the North-East quadrant, the positive supplementary value greater than 90° will result. Leaving this and considering only the values less than 90° – – we will make a mistake and obtain lesser values than we should realy obtain for the average value of ⊥ (010) ∧ X. In other words: this mistake will cause the value to move to the North in the Nikitin's quadrant diagram, i. e. it will come close to the high temperature curve, as happend to Pamić. True, his considerations were directed in quite a different direction, as will be shown here, but this does not alleviate the mistake he made in his conclusions. Pamić used the coordinates ⊥(010) ∧ X as obtained by usual U-stage measurements, i. e. their absolute values less than 90°, not considering the sign, as it is clearly shown in the Fig. 2 of his report (Pamić, 1972, p. 47), from the available determinations for the coordinate ⊥(010) ∧ X, the procentual distribution of the measurements obtained is so:

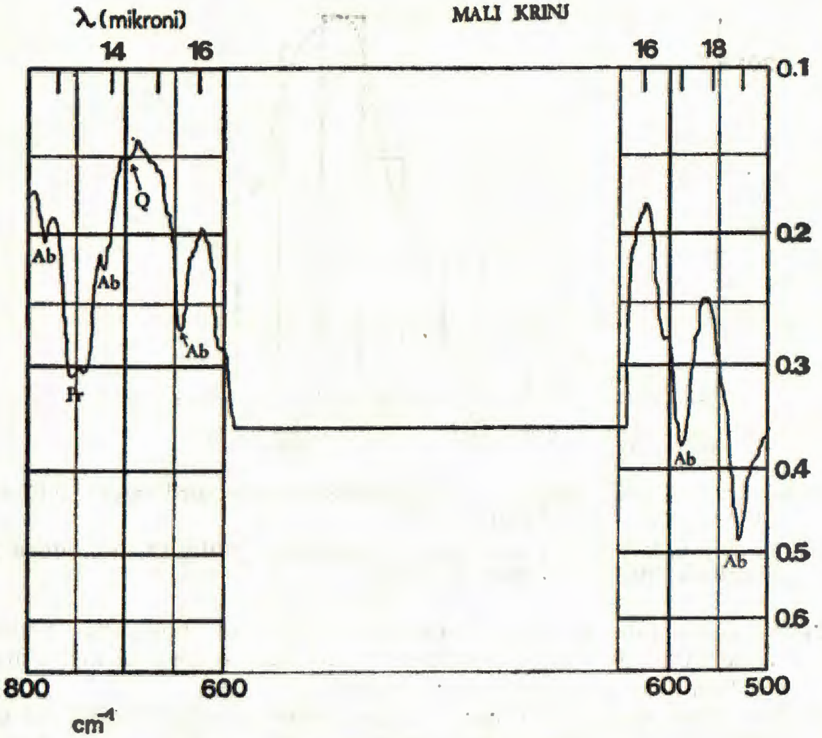
the value of	80°	forms	1.3%;
„ „	81°	„	2.7%;
„ „	82°	„	2.7%;
„ „	83°	„	5.4%;
„ „	84°	„	8.1%;
„ „	85°	„	8.7%;
„ „	86°	„	14.2%;
„ „	87°	„	22.7%;
„ „	88°	„	20.9%;
„ „	89°	„	12.8%;

totaling: 99.5%



Text-fig. 1a: Infrared absorption spectrum.
Keratophyre — Locality: Trešanica near Bradina in Hercegovina (Yugoslavia).

Sl. 1a: Apsorpcioni spektar u infracrvenom području.
Keratofir — nalazište: Trešanica kod Bradine u Hercegovini (Jugoslavija).

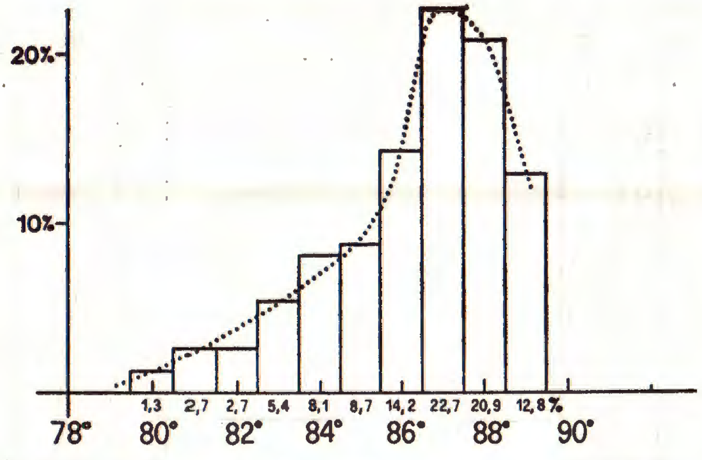


Text-fig. 1b: Infrared absorption spectrum.
Albitized diabase (spilite) — Locality: Mali Krinj (Krinjac), north of Sinj in Dalmatia (Croatia, Yugoslavia).
A=albite, Pr=prehnite, Q=quartz.

Sl. 1b: Apsorpcioni spektar u infracrvenom području.
Albitizirani dijabaz (spilit) — nalazište: Mali Krinj (Krinjac), sjeverno od Sinja u Dalmaciji (Hrvatska, Jugoslavija).

Only 0.5% of the values out of the 80°–89° range is not considered. The marked values – as it could be concluded from the Text-fig. 2 – are used to the $\pm 1/2°$. The already mentioned P a m i ć's Fig. 2 (1972, p. 47), showing frequency for the values of coordinate $\perp(010) \wedge X$, is refigured here, in order to enable an easier understanding of the text that follows. Only the dashed frequency curve is added to the original figure. Further on, P a m i ć concludes as follows:

1) the data dispersion curve should correspond to the curve of statistical distribution of the measurements data and it must be symmetrically shaped;



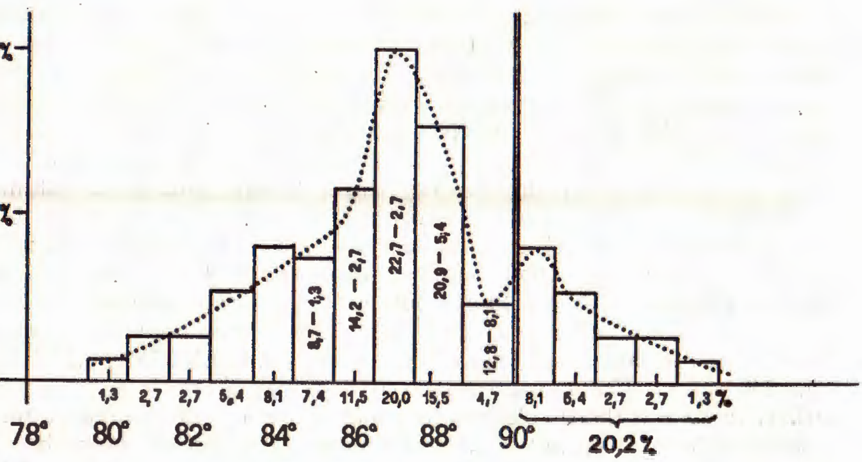
Text-fig. 2.: Diagram, containing measurements data for coordinates ⊥(010)ΛX, without sign (after Pamić, 1972).

Sl. 2: Dijagram, koji sadrži mjerenja za koordinatu ⊥(010)ΛX, bez obzira na predznak (prema Pamiću, 1972).

2) the curve falls to zero on one (left) side and shows the distinct tendency to decline to the other (right) side; according to Pamić the following conclusions are drawn;
3) the values overturned from the neighbouring (the South-East quadrant in the Nikitin's circle diagram) do not essentially influence the area of maximal concentration, respectively the change in the curve peak position and
4) the overturned data do not influence the left curve flank falling to zero.

Neither of the two last conclusions is correct. We will show that Pamić contradicts himself. Namely, he tries to reconstruct the hystogram of the primary, unsuperposed distribution for the coordinates ⊥(010) ∧ X before their overturn from the South-East to the North-East quadrant. In other words: he tries to reconstruct their distribution, as if even the sign could be determined in any of the individual measurements for the coordinate ⊥(010) ∧ X, or, in the case of a negative sign, as if the supplementary positive value greater than 90° could be determined. To the right of the curve peak, which corresponds to the value of 22.7%, come, up to 90°, two colums of 20.9% and 12.8%, respectively. The first column over 90° is, therefore, the third column from the peak, and according to Pamić it should contain as many separate values as the third column left from the maximum, i. e. 8,1%. Likewise, the second, third, fourth and fifth columns over 90°, according to P a m i ć, correspond to the fourth, fifth, sixth and seventh column on the left from the peak. These columms should contain the values of 5,4%, 2,7%, 2,7% and 1,3%, respectively. But where do these values come from? Here, P a m i ć does the following: to the first column over 90° he adds 8,1% of the first column under 90°, and, likewise, to the second, third, fourth and fifth columns over 90° he adds 5,4%, 2,7%, 2,7% and 1,3%, from the second, third, fourth and fifth columns, respectively, going to the left, i. e. toward the values less than 90°. Using this method, P a m i ć obtained a new curve for the distribution of coordinates ⊥(010) ∧ X, which, starting from the left side, has five unchanged columns (Text-fig. 3), containing the separate values as follows: 1,3%, 2,7%, 2,7%, 5,4% and 8,1%. After this, there comes a series of five columns with reduced values, i. e.: (8,7–1,3)%, (14,2–2,7)%, (22,7-2,7)%, (20,9–5,4)% and (12,8–8,1)%. Further to the right over 90°, as mentioned earlier, there are those columns to which P a m i ć attributed as many separate values (given in %) for coordinate ⊥(010) ∧ X as shown by subtrahends of the five previously mentioned differences, that is: 8,1%, 5,4%, 2,7%, 2,7% and 1,3%, or total of 20,2%. Thus, after these arbitrary considerations, P a m i ć concludes, since he has no available signs, in any of individual measurements, that only about 20% of the values – which do not essentially change the average value of the above mentioned coordinate – is overturned from the lower, South-East quadrant of the Nikitin's circle diagram to the upper, North-East quadrant. Ignoring the sign, P a m i ć (1972), p. 48 and 55) has the value of 86½°, and after his mentioned overturning in the columns over 90°, he gets, as he says, the real average value amounting to 87°.

Finally, it is clear now that at least twice P a m i ć's own considerations contradict themselves. The first contradiction is related to his statement that the curve of scattering of measurement data should correspond to the curve of the statistical distribution of measurement data, and, that this curve has to be symmetrically shaped. If we look at this curve, in Text-fig. 3 marked with a dotted line, we can see that its curve is far from being symmetrically shaped. This curve is even less symmetrical than the curve in Text - fig. 2, which shows the statistical distribution of measurement data, i. e. values with no signs. On the new curve (Text – fig. 3), two peaks are evident: the first, pointed one, for 20% value, and the second, less pointed one, for the value of 8,1%. The average value of 87% corresponds to the first peak. The second peak, which would have the average value of 91° (or 89° with no sign), P a m i ć does not comment. Neither does he say anything about the sagging of the curve in the first column to the left of the 90° ordinate, nor what induced him to change the otherwise uniformly rising (each at 2°) abscisse scale in the two columns left of the 90° ordinate, and, thus, these columns are somewhat wider than the other columns. Another point should be made here, in connenction with the new curve (Text -



Text-fig. 3: Reconstructed diagram, containing primary, unsuperposed distribution of coordinate values ⊥(010)ΛX, i. e. distribution with sign, supposed by P a m i ć.

Sl. 3: Rekonstruirani dijagram, koji prema P a m i ć e v o j pretpostavci prikazuje primarnu, nesuperponiranu razdiobu koordinata ⊥(010)ΛX, tj. razdiobu sa predznakom.

fig. 3). Is there a possibilitiy that similar aberration – very important in value – from the imagined curve of symmentrical distribution, and observed in the columns immediately to the left of 90°, may also be present in the columns situated more to the left? This possibilitiy cannot be denied. In that case, however, P a m i ć's considerations connected with the construction of the curve in Fig. 3 do not make any sense.

The second contradiction is related to Pamić's statement (1972, p. 47), which is mentioned above under the number 4. In this allegation he says that the values from the neighbouring South-East quadrant of the Nikitin s circle diagram, which, since their sign is unknown, are also contained in the North-East quadrant, do not influence the flank of the statistical distribution curve declining toward zero (in Text-fig. 2 the left flank from the peak). Namely, contrary to that, P a m i ć reduces the initial values of 14,2% and 8,7% for 2,7% and 1,3% on 11,5% and 7,4% in the first and second columns left from the peak, as is shown in Text-fig. 3.

In his considerations P a m i ć also quotes the average values of anorthite content from individual microscopic determinations. Here, the data for this content vary from 0% to 10%, and more. In considerations of this kind, not allowed since these great variations in the chemical composition change the value, form and position of the indicatrix in the fixedly imagined crystal structure. For example, the chemical changes are not followed by the linear modifications of the optical axial angle values. For this approach, as mentioned earlier, Pamić needed the quantitative chemical analysis of one or several selected samples, as well as a precise determination of their optical characteristics.

Pamić (1972, p. 44 and 52) goes further to state categorically that he has not published the new migration curve for normal to (010) of acid plagioclases, referring so to my allegation in this sense (Barić, 1972, p. 34.). Here, I have to say that this was my statement also. I said even more, particularly that this curve will never see day-light. Therefore, we agree at this point.

II

After all, it should be surprising how Pamić continues to defend his supposed discovery of albites from the spilite-keratophyre association in the Dinarids, whose optics, according to him, clearly point to the high-temperature albite. He goes so far as to state (Pamić, 1972, p. 49 and 56) that albite from spilites has a high-temperature form, even if it is crystallized at low temperatures. According to Pamić, this is not surprising — the opposite case would be peculiar, he says – because the rapid crystallisation produces disordered much more easily than ordered lattices, even in PT conditions out of the disordering stability of high temperature modifications. In connection with this he refers to Goldsmith (1953). To avoid Pamić's generalisation with no experimental basis, I have tried to check his information by very precise investigation of absorption in the IR spectrum. For this purpose four samples of spilite-keratophyre rocks from Yugoslavia have been selected, and these are:

1) the keratophyre from the Trešanica canyon near Bradina in Hercegovina;
2) the rock sample from Greblje locality, in the area of Podosoje village, south-east from Vrlika in northern Dalmatia (Croatia);
3) the rock from the Mala Stražina locality, also from area of the Podosoje village;
4) the rock from Mali Krinj (Krinjac) locality, north of Sinj in Hrvatačko Polje (Dalmatia, Croatia).

The first rock has already been described (Barić, 1970, 1973). The rocks 2), 3) and 4) represent albitized diabases (spilites). They are very similar. More detailed analysis have been done only for rock no. 4 (Barić, 1969a, p. 354–370). Today, localities 2 and 3 are sunk in the storage basin of a hydroelectric power plant.

The four samples have been sent to the Department of Geology of Stanford University (California, U. S. A.), where Mr. T. M. Elliot made absorption spectrum for IR-wavelenghts. His help is gratefully acknowledged here. Mr. Elliot has investigated the absorption in a broad IR spectrum, from 300 cm^{-1} to 4000 cm^{-1}. From 2 mg of powdered rock and 1000 mg of KBr the pastelles have been made. Thus, the concentration was 0,2‰. The spectrogram for the sample 1 (Trešanica) is given in Text-fig. la, and Text-fig. 1b shows the spectrogram for the sample 4 (Mali Krinj or Krinjac). These show only a part of the spectrum, from 500 cm^{-1} to 800 cm^{-1}, because brightness and local amplitudes of the peaks in that interval are enough for estimation of the structural state of albite in the mentioned samples. In these figures, Q marks quartz, Ab marks albite, and Pr stands for prehnite. On the basis of these diagrams – on which the pointed peak is shown also at 647 cm^{-1} – it follows, as Mr. Elliot informed me, that the sample 1 (Trešanica) contains low-temperature, well-ordered albite.

The spectrograms of the samples 2 (Greblje) and 3 (Mala Stražina) are similar to that of the sample 4 (Mali Krinj or Krinjac). All samples contain low-temperature albite (or *low* albite, as Elliot says).

Therefore, contrary to Pamic' s unfounded opinion, the precise investigation of absorption in IR spectrum shows that the rocks of spilite-keratophyre association, in the Dinarids, contain the low-temperature albite with a well-ordered structure. In this view, these rocks in Yugoslavia do not represent any exception in comparison with similar rocks elsewhere in the world.

Here, it may be mentioned that Brajdić, (oral communication), investigation of absorption in IR spectrum shows that the rocks of spi-Okić-grad, south-west of Zagreb, from IR-spectrum analysis, has also found the low-temperature albite with well ordered structure. I wish to thank him for this kindly supplied information from his yet unpublished paper.

III

As further evidence for his unfounded statements, Pamić discusses (1972, p. 50 and 56) volcanic rocks with potassium and sodium feldspars. Here he points out that K-feldspars with high-temperature, sanidine-optics have been found in several places. Thus, within the shell of high temperature K-feldspars there is albite. Prior to this, he also talks about this feature (Pamić & Papeš, 1969b, p. 572 and 576). We have to say that optical properties of these K-feldspars are rather unusual, if Pamić's description is to be followed. The crystals are idiomorphic or hypidiomorphic (Pamić, 1962, p. 50; Pamić & Papeš, 1969, p. 565). The crystal individuals are the most frequent; sometimes, but rarely, there are Carlsbad twinnings. They are fresh or almost fresh. In spite of this they are very difficult to be determined, since they are optically very unhomogenous and very often they darken undulatory. While P a m i ć states that he determined their optical axial angle with 2V = – 10° up to – 40° in a more recent work (P a m i ć & P a p e š, 1969, p. 565), earlier (P a m i ć, 1962, p. 50) he produced such data that it is reasonable to doubt the accuracy of his determinations. This is what he says: »In sections with both optical axes the optical axial angle is: $V_1V_2 = 0°$. In sections with one optical axis, the obtained values for the optical axial angles vary: 2V = –21° up to – 40°«. It is necessary to point out the following:

1) If the optical axial angle is 0°, then a mineral is uniaxial.

2) If the sections of the optically biaxial minerals of which only one optical axis is measurable are viewed, then the value obtained for the optical axial angle is the same as if both optical axes are directly measured. It is incomprehensible that for the same mineral, in sections with one measurable optical axis, the obtained values systematically differ from the results obtaned on the sections with two optical axes which are accessible for direct observation. To solve these contradictions, P a m i ć should carry out a revision of his data by performing new measurements on the previously adjusted instruments. If he would persist on his previously mentioned data on sanidine, we would be compelled, unfortunately, to conclude, that he wants to inform us about an impossible, grotesque crystal optic, according to which the optical characteristics of the same crystallized substance would depend on the orientation of the crystal section, in which we determine it. Regarding this, it is necessary to point aut that P a m i ć's optical determinations should be only considered with great caution and the utmost restraint.

Concerning the high content of K_2 = 10,42% (with 0,86% Na_2O) (P a m i ć, 1962, p. 51), the adequate revision of data is required because, for the rock which P a m i ć names K-spilite, he does not allege the existence of any potassium mineral except sanidine. Considering that (a) – in the rock with a relatively high amount of vesicles filled with calcite, chlorite or chalcedony; (b) that the groundmass is less in quantity than the phenocrysts; and (c) that there is little glass in the groundmass, in which a part of K_2 and Na_2O, determined in the chemical analysis, could be associated then it should be taken for granted, by good approximation, that K_2 is almost entirely associated in the K-feldspars, which, in this case, should make almost 2/3 of the weight of the entire rock.

IV

In section I it is mentioned that P a m i ć (1969a, p. 209) says that his determinations of albite by the Fedorov U-stage method in spilites and keratophyres mostly fall on the migration curves for the high-temperature optics. Talking about how spilites, keratophyres, quartz keratophyres and volcanites rich in potassium are, in many places, associated with the normal subalkaline rocks and that their link, as far as miral composition in considered, is proved by the presence of transitional varieties (andesine keratophyre and andesine spilite), P a m i ć (1969a, p. 213) mentions, that the rocks with albite are determined also among the abyssal and hypabyssal derivates produced by the same magmatic activity. Immediately after saying that, P a m i ć points out as a very important feature that the feldspars show the high-temperature optic in the two main volcanite groups.

Comparing the recently published (1974) English edition of P a m i ć's original paper in Croatian (P a m i ć, 1969a), it can be noticed that he does not mention, at all, his previous statements on high temperature optics for feldspars. Why has he omitted this in the English version? Does it mean the abandoning of his supposed discovery of high temperature albite in the Dinarids, the discovery which he has insised on publishing, what he succeeded to do in 1969. The manuscript of this paper (P a m i ć, 1969) was sent to me to be reviewed before printing. I warned P a m i ć that his conclusions on albite were inadmissible. From Sarajevo he wrote me a letter saying that he would discuss this problem with me. Up to date he has made no further mention of arranging a meeting with me.

After everything that has been mentioned above, it should be concluded that P a m i ć's avoiding of any discussion resulted in the introduction of untruth in the scientific world. Omitting everything that is connectied with his supposed discovery on high temperature albite, in the English edition of his study (P a m i ć, 1974), has apparently changed his mind. In 1969, I already referred (B a r i ć, 1969) to his inadmissible assumptions.

V

Wether the rocks of spilite-keratophyre association are of primary or secondary origin is still a subject of discussion among petrologists here and abroad. That is a basic problem of modern petrology. But, the method used by P a m i ć cannot answer this problem. With no evidence, his arbitrary standpoint on high-temperature albite in the Dinarids, now self-denied by him, caused a few misunderstandings in our scientific literature. In his historical survey of the development of geological sciences in Yugoslavia, M a r i ć (1974, p. 160) quoted T a j d e r, who had been investigating the albite rocks in Slavonia (Croatia), as saying »in his petrographical interpretation he (T a j d e r) concluded that albite in these rocks is a primary mineral component, which was formed directly by a crystallization from magma, and therefore has the high-temperature optics«. Then M a r i ć talks about P a m i ć's work on albite rocks from Bosnia and Hercegovina and his conclusions. M a r i ć says that P a m i ć has concluded

»... as well as M. Tajder regarding the rocks in Slavonia, that the albite in the Central Bosnian (Ladinian) spilites, keratophyres, and quartz keratophyres of Kupresko Polje, is a primary mineral component as well, having the high-temperature optics. As proof of that, he says that he (Pamić) has not found any mineral of the spilite reaction, then that the albite is found in the tuffs of the albite rocks, too, and finally, that the albite has high-temperature optics in these rocks, as is the case with potassium feldspars (sanidines), which are sometimes present in these rocks and also have high-temperature optics«.

Tajder indeed reported the results of his investigations of albite rocks from Slavonia in several papers (Tajder, 1944, 1947, 1955, 1956, 1956a, 1959 and 1960). In the first one mentioned here (Tajder, 1944, p. 77), he gives the following values for the optical axial angle derived from the U-stage measurements of the albite, its composition being 2% an to 10% an:

$$2V = +85^\circ; +87^1/_2{}^\circ; +88^\circ; +86^\circ; +86^\circ; -86^\circ; +88^1/_2{}^\circ; +81^\circ;$$

In his second paper (Tajder, 1974, p. 184), he gives the values between 4% an and 11% an with the average value little less than 8% an. There is no data on the optical axial angle.

In the paper from 1956 (Tajder, 1956, p. 37) there are a number of determinations for the albite in aegirine-albite-rhyolite, with 0% an up to 14% an, and giving twelve data for the optical axial angle:

$$2V = +80^\circ; +78^1/_2{}^\circ; -88^\circ; -88^\circ; +88^1/_2{}^\circ; +88^\circ; +80^1/_2{}^\circ;$$
$$+88^\circ; +88\tfrac{1}{2}^\circ \text{ and } -89^\circ.$$

For albite-rhyolite, Tajder (1956, p. 39–40) gives data varying from 0% an to 4% an, with the following values of the optic axial angle:

$$2V = +84^\circ; +86^\circ; +80^\circ; +84^\circ; +86^\circ.$$

For albite phenocrysts in the albite-rhyolite from Blacko in Požeška Gora (Požega Mountain), Tajder gives (1956a, p. 193) an optical axial angle value of $+86^\circ$.

Finally, Tajder (1960, p. 97) gives data for the optical axial angle $2V = -80^\circ$ and -81° for the oligoclase, in whose one grain he determined the composition as 17% an, found in the anorthoclase-aegirine-rhyolite from the Rupnica brook near Voćin.

The above mentioned information that albite in the albite rocks of Slavonia has, according to Tajder's investigations, the high-temperature optic, does not correspond to the real one and it is to be rejected. Namely, nowhere in his works does Tajder mention that the albites are high-temperature ones. On the contrary, from the numerous values of the optical axial angle determined by T a j d e r, and mentioned in his paper, it can be concluded, without doubt, that there is no high-temperature optical albite mentioned anywhere. The albite optical axial angle should be considerably less in the latter case, around 50°, and with a negative sign (T r ö g e r, 1971, p. 126). Even for 17% oligoclase, from the Rupnica brook, the values for the optical axial angle should be considerably less (around -60°) than the values determined by T a j d e r (2 V = -80° and -81°). However, the rocks from Slavoniá which have been mentioned, cannot be compared with similar rocks in the Dinarides, because the rocks from Slavonia are presumably younger, being Tertiary in age (T a j d e r, 1959, p. 386).

Now, we will take into consideration P a m i ć's assumption that albite in Middle Triassic (Ladinian) rocks of spilite-keratophyre association from Kupresko Polje in Bosnia have high-temperature optics. This consideration will be, in particular, based on his assumption that albite – similar to K-feldspars (sanidine), which sometimes occur in these rocks – has high-temperature optics as well. In fact, P a m i ć (1969b, p. 572 and 576) states that effusive rocks in Kupresko Polje contain sodium rich rocks in association with potassium rich rocks, where K-feldspar has the high-temperature sanidine optical properties (P a m i ć, 1969b, p. 565), as earlier he had determined in the volcanic rocks in the area of Ilidža–Kalinovik (P a m i ć, 1962, p. 50). In some cases, he says (P a m i ć, 1972, p. 50), he clearly determined sanidine reaction rims around albite, and thus albite originated firstly at high temperatures while sanidine originated later at lower temperatures. Therefore he draws this conclusion (P a m i ć, 1969b, p. 572): »In this case it would not be logical to treat, in a united association of volcanic rocks, the otherwise lower temperature potassium feldspars from poeneites as primary ones, and higher temperature albites from keratophyres and spilites as secondary minerals«.

Such a conclusion is more than naive. We will show this in the example which everyone knows very well. In the plagioclase group, the members rich in calcium are less resistant than the members rich in sodium. In zonally structured plagioclases in igneous rocks the central part rich in calcium will be very often partly or totally altered into an accumulation of fine grains of zoisite and clinozoisite, new acid feldspars, quartz, etc., while the more acid rim will be unaltered. This may be clearly seen in microscopic sections. Therefore, nobody will conclude that central part originated earlier, at a higher temperature than the rim.

In addition to the just mentioned general case it would be worth while to mention one special case, although this one, too, has general significance. K n e ž e v i ć & Đ o r đ e v i ć (1969, p. 492) talk, for example, about the plagioclases with zonal structure and with 32% to 38% an from Triassic volcanites in the Budva–Sutomore area in the

Montenegro coastal region. They are very altered, calcitized and kaolinized and their middle parts are intensively destroyed, and more or less altered zones are observed.

VI

On December 12, 1974, Lj. Golub and M. Vragović gave a lecture on the eruptive rocks of Dalmatian islands, in the Croatian Geological Society in Zagreb. They reported on the results of their investigations. On the island Jabuka, they found out that basic plagioclase (labradorite or bytownite) is often transformed into the acid plagioclase (albite or oligoclase). This transformation is in some places more developed than in other parts of the eruptive mass of the island. This may be recognized easily on the field. On several good photomicrographs the authors showed good examples of how one or several parts of yet untransformed basic plagioclase are left in the albite. In these examples the transformation of bytownite into albite is not completed. In the examples of the complete transformation there are the albite pseudomorphs, resulting from the former basic plagioclase. I have to refer to their paper for more detailed information. This paper will be published in the next volume of Acta geologica of Yugoslav Academy of Science and Arts (abbrev. JAZU) in Zagreb, in 1975.

In these igneous rocks from the vicinity of Komiža on the island of Vis, Šćavničar & al. (1975) recently identified pumpellyite. This is very important regarding the origin of spilites. Here, I would like to repeat Winkler's (1974, p. 189) words: »Although a primary, magmatic origin of spilites is still upheld by some, such an origin is ruled out because of mineral parageneses found in many spilites. Although the common association chlorite + albite + calcite of many spilites is not very diagnostic, other assemblages mentioned above are. Thus Coombs (1972) concludes, spilites may occasionally be ascribed to the zeolite facies, and more commonly to the prehnite–pumpellyite, pumpellyite-actinolite, and greenschist facies. The prehnite-pumpellyite facies is particularly commonly represented, especially in New Zealand«. Coombs' paper quoted here by Winkler, was really published in 1974. In this paper, Coombs (1974, p. 337) says: »Presumably basaltic and andesitic lava flows may be affected in the same ways as the sediments by low-grade metamorphic processes«.

VII

In his general survey of plagioclase data from Triassic effusives in Slovenia (Yugoslavia), Faninger (1971, p. 228 and 230) concludes, that high-temperature form is only determined for andesine in quartz-

-porphyrite of the Kokra-quarry, south from Mt. Grintovec (Savinja Alps). In all remaining Triassic volcanic rocks from Slovenia plagioclase is low-temperature albite. This is confirmed by Hamrla's (1954), Germovšek's (1959) and Faniger's (1962) measurements. Besides, Hinterlechner (1959) has also determined partial or full albitization in east Slovenia caused by spilite reaction. This occurence of albitization in our rocks was already refered in 1957 (Barić).

High temperature albites in the rocks of the Middle Triassic spilite-keratophyre association in the Dinarids do not occur. The opposite reports by Pamić (1969, 1969a, 1969b, 1972) have no scientific foundation at all; they are arbitrary and incorrect. Therefore, his conclusions (Pamić, 1969, p. 4 and 1972, p. 49 and 56) that his results can be very useful for petrogenetical considerations and explanations of primary or secondary origin of Na- and K-feldspars in the Middle Triassic association of spilite-keratophyre rocks in the Dinarids, do not have any value.

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REFERENCES

Barić, Lj. (1969): Vorläufige Erwiderung auf die von J. Pamić gegebene Mitteilung über die Feldspäte mit Hochtemperatur-Optik in den Gesteinen der mitteltriassischen Spilit-Keratophyr-Assoziation in Dinariden. — Mitteil. Minneralogisch-petrogr. Museums Zagreb ,p. I. Zagreb.

Barić, Lj. (1969a): Eruptivgesteine (albitisierte Diabase) in der Umgebung von Sinj in Dalmatien. — Geol. vjesnik, 22, 349—410. Zagreb.

Barić, Lj. (1970): Keratofir iz klisure Trešanice kod Bradine u Hercegovini. — Glasnik Zemalj. muz., n. s. 9, prirodne nauke, pp. 5—12. Sarajevo.

Barić, Lj. (1972): Sind eigentlich in den Gesteinen der mitteltriassischen Spilit-Keratophyr-Assoziation in Dinariden die Albite, deren Optik angeblich völlig klar auf die Hochtemperaturoptik hinweist, enthalten? — VII kongres geologa SFRJ, Zagreb 28. IX — 4. X 1970. Predavanja, II knjiga, pp. 29—41. Zagreb.

Barić, Lj. (1973): Keratophyr aus dem Engtale des Trešanica-Baches bei Bradina in der Hercegovina. — Wissenschaftl. Mitt. des bosnisch-herzegovin. Landesmuseums. 3, Heft C (Naturwissenschaft), 5—12. Sarajevo.

Coombs, D. S. (1974): On the mineral facies of spilitic rocks and their genesis. — Spilites and spilitic rocks, pp. 373—385. Edited by G. C. Amstutz. — Springer-Verlag, Berlin/Heidelberg/New York.

Faninger, E. (1971): Plagioklazi v triadnih predorninah na Slovenskem. (Plagioklase in den triadischen Ergussgesteinen Sloweniens). — Geologija, 14, 227—233. Ljubljana.

Germovšek, C. (1959): Triadne predornine severovzhodne Slovenije. (Triassic eruptive rocks in Northeastern Slovenia). — Slovenska akad. znan. umetn. Dela (opera), 11. Ljubljana.

Goldsmith, J. R. (1953): A »simplexity principle« and its relation to »case« of crystallisation. — Journ. Geol., 61, 439—451.

Hamrla, M. (1954): Geološke razmere ob severnem robu laške sinklinale vzhodno od Savinje. (Geological relations along the northern border of the Laško syncline east of the Savinja-River). — Geologija, 2, 243—261. Ljubljana.

Hinterlechner, A. (1959): Spilitizirani diabazi v vzhodni Sloveniji. (Spilitized diabases in Eastern Slovenia). — Geologija, 5, 152—163. Ljubljana.

Kneževič, P. & Đorđević, V. (1969): Trijaski vulkaniti sa područja Budva–Sutomore (Crnogorsko primorje). (The triassic rocks of the Montenegrin littoral between Sutomore and Budva were formed in two phases). — Geol. anali Balk. pol. 34, 489—507. Beograd.

Marić, L. (1974): Minerali, stijene i rudna ležišta u našoj zemlji od prehistorije do danas. (Discovery, analysis and exploitation of rock minerals and mineral deposits in Yugoslavia from prehistoric times until the present day). — Ed. JAZU & SANU. Zagreb.

Pamić, J. (1962): Petrološka studija efuzivnih stijena u oblasti Ilidža–Kalinovik (Bosna). II. područje izvorišta rijeke Željeznice. [Petrography and petrology of extrusive rocks in the area of Ilidža–Kalinovik (Bosnia). Part II: The spring region of the river Željeznica]. — Geol. glasnik, 6, 45—60. Sarajevo.

Pamić, J. (1969): High-temperature feldspars from the Middle-Triassic spilite-keratophyre association of the Dinarids. — Bull. Scient., (A), 14/1—2, 4. Zagreb.

Pamić, J. (1969a): Srednjotrijaska spilit-keratofirska asocijacija Dinarida i njezin položaj u alpskom magmatsko-tektonskom ciklusu. (Middle Triassic spilite-keratophyre association of the Dinarids and its position in the alpine magmatic-tectonic cycle). — Geol. glasnik, 13, 205—216. Sarajevo.

Pamić, J. (1972): U spilit-keratofirskoj asocijaciji Dinarida javljaju se albiti kojima optika — bar prema raspoloživim teodolitno-mikroskopskim podacima — stvarno tendira prema visokotemperaturnoj optici. (The rocks of the Middle Triassic spilite-keratophyre association of the Dinarides do contain albites tending to high temperature form). — VII kongres geologa SFRJ, Zagreb 28. IX — 4. X 1970. Predavanja, II knjiga, 43—58. Zagreb.

Pamić, J. (1974): Middle Triassic spilite-keratophyre association of the Dinarides and its position in alpine magmatic-tectonic cycle. — Spilites and spilitic rocks, 161—174. Edited by G. C. Amstutz. Springer-Verlag, Berlin/Heidelberg/New York.

Pamić J. & Papeš J. (1969): Produkti ladiničkog magmatizma u širem području Kupreškog Polja (Bosna). [Petrology and geology of Middle Triassic igneous rocks in the area of Kupreško Polje (Bosnia)]. — Geol. anali Balk. pol., 34, 555—576. Beograd.

Šćavničar S., Međimorec, S. & Šćavničar B. (1975): Pumpellyite in the magmatic rocks of Komiža. — Bull. Sci. (4), 20/1—2, 3. Zagreb.

Tajder, M. (1944): Albitski riolit Požeške gore. (Albit-Rhyolith von Požega-Gebirge). — Vjestnik hrv. drž. geol. zavoda i hrv. drž. geol. muzeja, 2—3, 74—88. Zagreb.

Tajder M. (1947): Albitski dolerit iz Nakop potoka u Požeškoj gori. (Albite dolerite from Nakop Brook in Požega Mountain). — Geološki vjesnik, 1, 182—189. Zagreb.

Tajder M. (1955): Istraživanje Papuka i Požeške gore. Ljetopis JAZU, 60 (1953), 307—308. Zagreb.

Tajder, M. (1956): Albitski efuzivi okolice Voćina i njihova geneza. (The albite volcanic rocks of the Voćin area and their origin). — Prirod. istraž. JAZU 27 (Acta geologica 1), 35—48. Zagreb.

Tajder, M. (1956a): Albitski riolit od Blackog u Požeškoj gori. (Albit-Rhyolith von Blacko im Požega-Gebirge). — Geološki vjesnik, 8—9, 191—196. Zagreb.

Tajder, M. (1959): Petrografsko proučavanje Požeške gore. — Ljetopis JAZU ,63 (godina 1956), 383—387. Zagreb.

Tajder, M. (1960): Anortoklasni egirinski riolit iz potoka Rupnice kod Voćina. (Anorthoclase-aegirine-Rhyolithe from Rupnica brook near Voćin). — Prirod. istraž. JAZU, 29 (Acta geologica, 2), 95—101. Zagreb.

Tröger,. W. E. (1967): Optische Bestimmung der gesteinsbildenden Minerale. Teil 2: Textband. Mit Beiträgen von Bambauer, Braitsch, Taborszky & Trochim. — Schweizerbart'sche Verlagsbuchlandl., Stuttgart.

Tröger,. W. E.(1971): Optische Bestimmung der gesteinsbildenen Minerale. Teil 1: Bestimmungstabellen. 4. neu bearb. Aufl. von Bambauer, Taborszky & Trochim. — Schweizerbart'sche Verlagsbuchhandl., Stuttgart.

Winkler, H. G. F. (1974): Petrogenesis of metamorphic rocks. Third ed. — Springer-Verlag, Berlin/Heidelberg/New York.

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ALBIT U STIJENAMA SPILITNOKERATOFIRSKE ASOCIJACIJE U DINARIDIMA JE NISKOTEMPERATURNI ALBIT SA DOBRO SREĐENOM STRUKTUROM

I. Godine 1969. Pamić je objavio prvo saopćenje o visokotemperaturnim glinencima iz stijena spomenutih u naslovu. Najprije je na temelju dotadašnjih teodolitnomikroskopskih podataka oprezno rekao, da se ne može učiniti definitivni zaključak o optičkom karakteru albita. Napuštajući oprez, na kraju istog saopćenja veli, da njegova razmatranja ipak sasma jasno ukazuju na visokotemperaturni oblik albita. To, prema njemu, može biti od koristi pri razmatranju problema o primarnom ili sekundarnom porijeklu albita u tim stijenama. Nešto kasnije Pamić (1969a, p. 209) ističe kao interesantnu činjenicu to, da pri teodolitnomikroskopskom određivanju po Fedorovljevoj metodi, rješavanja za albit padaju većinom na migracione krivulje za visokotemperaturni albit.

Pamić je pritom prešao preko činjenice, da se veličina kuta optičkih osi kod plagioklasa bogatih ab-komponentom vrlo osjetljivo mijenja u ovisnosti o tom, da li se radi o visokotemperaturnom ili pak o niskotemperaturnom plagioklasu, odnosno o stupnju sređenosti u njihovoj kristalnoj rešetki (Tröger, 1967, p. 733). Za visokotemperaturne albite kut optičkih osi je razmjerno malen i ima negativan predznak. Pamić (1972, p. 44 i 52) međutim kaže, da je on iz 185 raspoloživih vrijednosti iz literature dobio srednju vrijednost $2V = +82^{1}/_{2}°$ uz prosječno 4,2% an u albitu.

Kad mi je Pamić poslao na uvid rukopis svojeg gore spomenutog prvog saopćenja, upozorio sam ga kratko na nedostatke i pogreške u njegovim izvodima.. Odgovorivši on je izjavio, da će to sa mnom prodiskutirati. Na diskusiju do danas nije došao. Kasnije (Barić, 1972) sam svoje primjedbe iznio i opširnije. Prolazeći preko svih upozorenja, Pamić je svoje nemoguće stanovište pokušao braniti frekvencijom određivanja sferne koordinate $\perp(010)\Lambda X$, koja se pri teodolitnomikroskopskim određivanjima pomoću Nikitinovoga kvadrantnog dijagrama obično određuje u apsolutnom iznosu, manjem od 90°. Vrlo rijetko je naime mikroskopičar u mogućnosti, da odredi i predznak te koordinate, jer obično on ne opaža tri međusobno neovisna geometrijska elementa. Baš u ovom slučaju bi poznavanje predznaka bilo vrlo potrebno. Uslijed pogrešaka pri mjerenju, dolazi naime do rasipanja vrijednosti, zbog čega će pojedine vrijednosti biti i u jugoistočnom kvadrantu Nikitinovoga kružnog dijagrama (F e d i u k, 1961 sl. 73), jer se vrijednost spomenute koordinate za albit samo malo razlikuje od 90°. U jugoistočnom kvadrantu je sferna koordinata ⊥(010)ΛX manja od 90° i negativna. Mjeri li se ona od +X u sjeveroistočnom kvadrantu, imat ćemo u tom slučaju pozitivnu suplementnu vrijednost veću od 90°. Zanemari li se to, dobit će se pri izračunavanju srednje vrijednosti manje nego što u stvari mora biti. Drugim riječima: u jednokvadrantnom dijagramu će zbog toga srednja vrijednost biti pomaknuta prema sjeveru, odnosno bliže krivulji za visokotemperaturne plagioklase, kako se to dogodilo P a m i ć u, premda je on svoja razmatranja vršio na drugi način.

On je naime iz krivulje frekvencije vrijednosti, određenih za ⊥(010)ΛX u njihovom apsolutnom iznosu, tj. bez obzira na predznak (sl. 2), pokušao konstruirati krivulju frekvencije, kao da mu je bilo moguće odrediti spomenute koordinate. Pri tom je polazio od ovih postavki:

1) krivulja frekvencije podataka treba da odgovara krivulji statističke raspodjele podataka određenih mjerenjem odnosno ona mora biti simetrična;

2) krivulja opada prema nuli na jednu (lijevu) stranu (sl. 2) i pokazuje jasnu tendenciju opadanja na drugu (desnu) stranu. Radi toga (P a m i ć, 1972, p. 46) slijedi:

3) da vrijednosti prebačene iz susjednoga (jugoistočnoga) kvadranta u Nikitinovom kružnom dijagramu nisu bitno utjecale na područje najveće koncentracije odnosno na promjenu u položaju vrha krivulje; i

4) te prebačene vrijednosti nisu nimalo utjecale na lijevo krilo krivulje, koje opada prema nuli.

Diskusijom ćemo pokazati, kako P a m i ć sam sa sobom dolazi u protuslovlje. On želi iskonstruirati dijagram prvobitne raspodjele, tj. takve raspodjele kao da se u svakom slučaju pri određivanju sferne koordinate ⊥(010)ΛX mogao odrediti i njezin predznak, odnosno u slučaju negativnoga predznaka suplementna pozitivna vrijednost veća od 90°. Od vrha krivulje (sl. 2), koji odgovara vrijednosti od 22,7%, slijede na desno do 90° dva polja sa 20,9% i 12,8%. Prvo polje preko 90° je dakle treće polje od vrha krivulje i ono treba da prema P a m i ć u sadrži onoliko pojedinačnih vrijednosti (izraženo u %), koliko ih sadrži treće polje lijevo od vrha, tj. 8,1%. Slično — drugo, treće, četvrto i peto polje preko 90° odgovaraju po P a m i ć u četvrtom, petom, šestom i sedmom polju na lijevo od vrha krivulje, odnosno ona treba da sadrže redom 5,4%, 2,7%, 2,7% i 1,3% svih vrijednosti. Te vrijednosti on dobiva redom tako, da od prvoga, drugoga, trećega, četvrtoga i petoga polja ispod 90° oduzimlje 8,1%, 5,4%, 2,7% i 1,3% te ih prebacuje preko 90° na desno. Na taj je način dobio novu krivulju za frekvenciju vrijednosti sferne koordinate ⊥(010)ΛX, koju prikazuje sl. 3.

Sad se lako mogu razabrati nedostaci i protuslovlja opisane svojevoljne konstrukcije. Nova krivulja (sl. 3) još je dalje od toga, da bi odgovarala pojmu simetrije, nego prva krivulja (sl. 2). Na njoj se jasno ističu dva vrha: prvi izrazitiji za 20% i drugi manje izrazit za 8,1%. Prvom vrhu odgovara srednja vrijednost od 87°. O drugom vrhu, kojemu bi odgovarala srednja vrijednost 91° (odnosno 89° ne uzimajući u obzir predznak), P a m i ć ne kaže ništa. On ne govori ništa ni o ulegnuću krivulje u prvom području lijevo od ordinate za 90°, kao ni o tom, zašto je dva polja lijevo od te ordinate prikazao šire od ostalih polja.

U vezi s novom krivuljom (sl. 3) treba postaviti nadalje ovo pitanje: da li su slična — po veličini značajna — odstupanja od zamišljene simetrijske raspodjele, kakva se opažaju u područjima neposredno lijevo od 90°, moguća i u područjima dalje na lijevo? Ta se mogućnost ne može zanijekati. U tom slučaju međutim Pamićeva razmatranja u vezi s konstrukcijom krivulje u sl. 3 gube svaki smisao.

Daljnje protuslovlje odražava se u vezi s Pamićevom (1972, p. 47), tvrdnjom spomenutom gore pod brojem 4. Tu on kaže, kako vrijednosti iz susjednoga jugoistočnoga kvadranta Nikitinovoga kružnog dijagrama, koje su zbog nepoznavanja predznaka sadržane također u sjeveroistočnom kvadrantu, nisu nimalo utjecale na krilo krivulje statističke raspodjele, koje opada prema nuli (na sl. 2 krilo lijevo od vrha). Suprotno tomu, on je u prvom i drugom području lijevo od vrha početne vrijednosti od 14,2‰ i 8,7‰ smanjio za 2,7‰ i 1,3‰ na 11,5‰ i 7,4‰ radi konstrukcije sl. 3.

II. Izbjegavajući diskusiju i pokušavajući da brani svoje neodrživo stanovište, Pamić (1972, p. 49 i 56) je ustvrdio, da albiti spilita mogu pokazivati svojstva visokotemperaturne optike, čak ako su kristalizirali i uz niske temperature. To prema njemu nije nimalo čudno — bilo bi čudno suprotno, kaže on — jer se pri ubrzanoj kristalizaciji mnogo lakše formiraju oblici s neuređenom nego s uređenom rešetkom.

Da se ne bi ostalo pri ovom općenitom Pamićevom navodu, urađena su određivanja apsorpcije u IR-području spektra od četiri uzorka stijena iz spilitnokeratofirske asocijacije kod nas (sl. 1a i b). Iz tih određivanja vidi se, da se albit u svim primjerima nalazi kao niskotemperaturni, dobro uređeni albit. To je u skladu sa dosadašnjim optičkim podacima, posebno sa veličinom kuta optičkih osi, kako je gore spomenuto.

III. Pamić želi svoje neodržive nazore potvrditi i svojim opažanjem, da se unutar ljuske visokotemperaturnog K-glinenca nalazi albit. O tom će biti govora još kasnije u razdjelu V.

IV. Uz ostalo, Pamić (1969a, p. 209) i na tom mjestu govori o tom, kako njegova određivanja za albit po Fedorovljevoj metodi u spilitima i keratofirima većinom padaju na migracione krivulje za visokotemperaturnu optiku. Nešto kasnije, (Pamić, 1969a, p. 213) ističe on kao važan momenat i to, da glinenci pokazuju odlike visokotemperaturne optike u obje glavne skupine vulkanita u spilitnokeratofirskoj asocijaciji u Dinaridima.

Netom spomenuta Pamićeva publikacija objavljena je nedavno u engleskom prijevodu (Pamić, 1974). U prijevodu su izostavljena sva ona mjesta originalnog teksta, koja se odnose na konstatacije o visotemperaturnoj optici glinenca. U prijevodu o tomu nema ni riječi.

V. Ničim dokazano, sasma proizvoljno, Pamićevo gledište o visokotemperaturnom albitu kod nas u stijenama spilitnokeratofirske asocijacije, kojega se on sada eto šutke odriče, vrlo se rijetko spominje u našoj znanstvenoj literaturi, npr. u historijskom pregledu o razvoju geoloških znanosti kod nas (Marić, 1974, p. 160). Tu se navodi, kako je Tajder — ispitujući albitne stijene u Slavoniji — zaključio ,da je albit u njima primaran mineralni sastojak, nastao direktnom kristalizacijom iz magme i da prema tomu ima visokotemperaturnu optiku. U više svojih radova, koji se odnose na te stijene, Tajder (1944 do 1960) nigdje ne govori o visokotemperaturnom albitu u njima. Iz brojnih određivanja kuta optičkih osi, koja je on izvršio, vidi se naprotiv, da se radi o niskotemperaturnom albitu; njegovi podaci naime pokazuju, da je kut optičkih osi za taj albit velik i optički karakter — izuzev 4 vrijednosti između njih 26 — mu je pozitivan.

Pamić navodi, kao što je već spomenuto pod III, kako je u nekim slučajevima utvrdio, da sanidin jasno reakciono obavija albit, odakle prema njemu slijedi, da je albit nastao ranije, uz više temperature od visokotemperaturnog sanidina; radi toga bi bilo vrlo nelogično, da se višetemperirani albiti tretiraju kao sekundarni minerali (Pamić, 1969b, p. 572).

Taj zaključak je više nego naivan. Uzmimo kao primjer dobro poznati slučaj, da je kod zonarno građenih plagioklasa u eruptivima nerijetko središnji, bazičniji dio često potpuno ili djelomično izmijenjen u nakupinu od sitnih zrnaca coisita i klinocoisita, novog kiselog glinenca, kremena itd.; kiseliji ovoj često ostaje potpuno netaknut. Nitko iz toga neće zaključiti, da je središnji izmijenjeni dio nastao ranije, uz više temperature.

VI. Prema nedavnim, još neobjavljenim podacima Goluba i Vragovića, na otoku Jabuki često je bazični plagioklas (labrador ili bitovnit) izmijenjen u kiseli plagioklas (albit ili oligoklas), djelomično ili potpuno. U ovom potonjem slučaju radi se o pseudomorfozi albita po labradoru ili bitovnitu.

Brajdić mi je saopćio (iz svojih još neobjavljenih istraživanja), kako se iz urađenih spektograma u IR-spektru za albit iz spilitiziranih dijabaza u Samoborskoj gori i na Okić-gradu (zapadno od Zagreba) vidi, da se albit tu nalazi u niskotemperaturnom obliku.

Nedavno su u takvim stijenama kod Komiže na otoku Visu Šćavničar S., Međimorec i Šćavničar B. (1975) identificirali pumpeliit.

VII. Na temelju svega spomenutoga slijedi, da u stijenama srednjotrijaske spilitnokeratofirske asocijacije u Dinadidima ne dolazi visokotemperaturni albit, nego naprotiv niskotemperaturni njegov oblik. Radi toga Pamićevo mišljenje, kako njegovi rezultati mogu biti vrlo korisni pri petrogenetskim razmatranjima i tumačenjima o primarnom ili sekundarnom porijeklu Na- i K-glinenaca u spomenutim stijenama, nije, niti može biti, od bilo kakvoga značenja.

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