Reinterpretation of a Verzasca plagioclase: a correction

JOSEPH V. SMITH
Department of the Geophysical Sciences
The University of Chicago, Chicago, Illinois 60637

AND HANS-RUDOLF WENK
Department of Geology and Geophysics
University of California, Berkeley, California, 94720

Abstract

A single crystal of a metamorphic plagioclase from Verzasca Valley is An38 and not An63, as previously reported (Wenk et al. 1980). Structural properties including the satellite vector now conform better with those of igneous plagioclase.

E. Wenk et al. (1975) described an intergrowth of andesine (An3a) and labradorite (An63) from Gordemo, Verzasca Valley, in which the labradorite had e satellites with spacing and orientation typical of plutonic andesine. On the basis of X-ray analyses and electron microscopy of metamorphic plagioclase from the Central Alps, H.-R. Wenk (1979) and H.-R. Wenk and Nakajima (1981) concluded that the satellite e vector depends both on chemical composition and thermal history and not only on the An content as reported for igneous plagioclase (Smith, 1974, Figs. 5–12). A crystal from the Verzasca locality (Vz 433) was analyzed in some detail. The e vector was determined on a single crystal diffractometer and the average structure was refined from X-ray data (H.-R. Wenk et al., 1980). Microprobe analysis on the same crystal but a different fragment than that used in the refinement gave an An content of 63 percent. H.-R. Wenk et al. (1980) found that T-O distances for the Verzasca labradorite deviate from those in Figure 4 obtained for other plagioclases near An66. The T-O distances would fit with a low plagioclase of composition near An38. Also cell angles for the Verzasca labradorite (Wenk et al., Table 1) fit with those for a low plagioclase near An38, and the cell lengths are ambiguous. This was very suspicious and called for a reinvestigation.

New electron microprobe analyses of the same crystal fragment used for the X-ray studies show that it is actually an andesine An38. Presumably the earlier microprobe analysis had been made on the labradorite component of the intergrowth. The new analyses were made with a solid-state detector on an ARL-EMX-SM electron microprobe. The crystal was not removed from the fiber used for X-ray mounting, and a carbon coat was applied. It was necessary to burn a hole through a thin coat of glue. The consistency of Si, Al, Ca and Na values suggests that the analysis of An38 is correct to ±An5, and analyses down the length of the crystal were mutually consistent. Greater absorption for Na than for Ca X-radiation may have biased the analysis to a higher An content.

The corrected chemical analysis applies to all structural data for 433 Verzasca in the tables published by H.-R. Wenk et al. (1980) and to the e vector and lattice parameter data in Table 2 of Wenk (1979). It does not apply to the photomicrograph of the e-structure (Fig. 2c) in Wenk et al. (1980). As part of this investigation we have redetermined the e vector of both andesine and labradorite from an intergrowth with selected area electron diffraction and simultaneous microanalysis within the electron microscope. Results are the following.

<table>
<thead>
<tr>
<th>Structure</th>
<th>e Vector</th>
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<tbody>
<tr>
<td>andesine</td>
<td>An38-40</td>
</tr>
<tr>
<td>labradorite</td>
<td>An70-75</td>
</tr>
</tbody>
</table>

These values are more similar to those of igneous plagioclase (An65-70: T 42–50Å, Gay 1956). The same is true for structural parameters which are now similar to those of igneous andesine. Until proven otherwise, there is no need to assume that the e-vector of metamorphic plagioclase is a simple function of metamorphic grade as stipulated by H.-R. Wenk (1979). However, recombination of e APB’s in metamorphic plagioclase demonstrates that the e superstructure is less regular than in igneous crystals (Wenk and Nakajima, 1981) which corresponds to observations in annealed metal alloys (Van Tendeloo et al. 1975).

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References

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