

ALKALI AMPHIBOLES OF THE WICHITA MOUNTAINS

Nancy Scofield
M. Charles Gilbert

INTRODUCTION

Within and cutting the granites of the Wichita Mountains are irregular bodies, dikes, and pegmatites of alkali amphibole-bearing granitoids and aplites. These dikes and pegmatites represent the last differentiates of the granitic magmas. Thus, their mineral and chemical compositions should help in determining the path of crystallization of the granites. A report of some of our work is presented here.

Seven sample sites from these amphibole dikes and pegmatites were chosen for study. Their locations are shown on the maps in figures 2 and 39. Sample 7 is from the Lugert Granite of the western Wichita Mountains, and can be compared with the other six samples, which are all from the eastern area. Sample 5 is from the main Hale Spring pegmatite (fig. 40) (dike 1 of Johnson, 1955), and sample 2 is from a related dike, both of these cutting the Roosevelt gabbro but presumed related to the Quanah Granite (see Stop 3). The other samples are from dikes cutting the Quanah Granite, with the exception of sample 4, which cuts the Mount Scott Granite near the Quanah-Mount Scott contact.

The Quanah Granite is coarse grained and equigranular. Averaged modal proportions are 30 to 40 percent quartz and 55 to 65 percent perthite. The Lugert Granite has nearly identical modal proportions, but it is texturally much more variable and commonly is reported to contain a few percent plagioclase. All the Wichita granites have very low contents (1.5–5 percent) of ferromagnesian minerals, which are green hornblende, mainly brown biotite, and magnetite. Only the Quanah commonly carries sodic amphiboles in some of its facies (Myers and others, 1981).

The amphibole-bearing granitoid dikes and pegmatites consist mainly of albite, K-spar, quartz, sodic amphiboles and pyroxenes, and, in places, magnetite. The sodic pyroxene present in all the samples from the eastern Wichitas is aegirine, but in the western sample it is aegirine-augite.

SODIC AMPHIBOLES

This study concentrated on the composition of the amphiboles. They range in size and habit from fine (< 0.1 mm) needles of riebeckite to coarse (several cm) euhedra of black arfvedsonite. The dikes and pegmatites commonly show banding and alignment of these sodic amphiboles and pyroxenes.

Polished thin sections were studied petrographi-

cally and then by electron microprobe. Several photomicrographs (figs. 41–45) show typical relationships.

Electron-microprobe analyses were performed at the Institute of Mineral Research, Michigan Technological University, and at the Department of Geological Sciences, Virginia Polytechnic Institute and State University. A MAC-400 electron microprobe with Kevex 5100 energy dispersive system, with dedicated PDP 11/03 minicomputer, was used at Michigan Tech. Wavelength spectrometers using a TAP crystal were employed for Mg, Al, and F, with a thin window detector for F. The Virginia facility is an ARL SEMQ with three variable- and six fixed-wavelength spectrometers using data reduction methods of Bence and Albee.

Compositions are tabulated in tables 17 and 18, and the range of compositions from the eastern samples can be compared with those from the western sample (*M* = analysis from Michigan Tech; *V* = Virginia Tech). The blue needles of riebeckite were too small for analysis, and commonly were plucked out during sample polishing. All the analyzed sodic amphiboles are extremely iron-rich (32–35 weight percent as FeO). Amphibole from the west is much lower in F and Na₂O and somewhat lower in SiO₂ than eastern samples. K₂O is generally lower in the west, but overlaps the lower part of the range of eastern amphiboles. TiO₂ and MgO have wider ranges in the west, with TiO₂ ranging lower. Al₂O₃ can be higher in the west, and CaO and MnO are much higher in the west.

A wet-chemical analysis by S. S. Goldich, given in Johnson (1955), is provided for reference to a calculated formula. Formulae are not given for the microprobe determinations, owing to the lack of ferric-ferrous determinations. The real totals of these latter determinations will be higher on determination of H₂O and Fe₂O₃. Nevertheless, the trends are clear. These are very sodic, very iron-rich, and with as much as half the OH-position replaced by F.

Compositions of individual crystals were reasonably homogeneous in the east. All of these samples are members of the riebeckite–arfvedsonite series. In the west, the amphiboles appear to show zoning from arfvedsonitic cores to ferrorichteritic rims.

DISCUSSION

Ernst (1962) determined stable phase relations for bulk compositions between end-members riebeckite, Na₂Fe⁺²₃ Fe⁺³₂ Si₈O₂₂(OH)₂, and riebeckite–arfvedsonite solid solution, Na_{2.4}