AMPHCAL: A QUICKBASIC PROGRAM FOR DETERMINING THE AMPHIBOLE NAME FROM ELECTRON MICROPROBE ANALYSIS USING THE IMA RULES

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Abstract—The program AMPHCAL enables the user data entry, recalculation of chemical analyses from the electron microprobe analyses into amphibole structural formulae, determination of prefix, and classification of calculated results with specific names according to the current IMA guidelines. The program also permits the user four Al-in-hornblende geobarometers and amphibole-plagioclase geothermometer for certain types of calcic amphiboles. This program, written in QUICKBASIC, is menu-driven and easy to use on any IBM compatible microcomputers with VGA card. The compiled form of AMPHCAL is approximately 506 kilobytes.

Key Words: Amphibole, Microprobe, Classification, Geobarometry, Geothermometry.

INTRODUCTION

The IMA amphibole classification scheme (Leake, 1978) makes it possible to computerize and determine the amphibole names obtained either by electron microprobe or wet-chemical analysis. Mogessie and Tessadri (1982) wrote a BASIC program for electron microprobe amphibole analysis for a Commodore PET 2001 series. Rock and Leake (1983) wrote a FORTRAN program for the classification of amphiboles according to the 1978 IMA scheme, and in 1984 Rock and Leake presented an extensive revision to the 1978 IMA report. In this paper, the various amphibole analyses (after Deer, Howie, and Zussmann, 1962) were calculated and compared with the 1978 and 1984 IMA rules. Rock (1987) introduced a FORTRAN program, AMPHTAB, for tabulating and naming amphibole analyses based on the 1984 IMA scheme using Apple Macintosh machines. Richard and Clarke (1990) wrote a program with the code name AMPHIBOL for IBM-compatible computers. Included in this paper, were five recalculation schemes for amphibole analyses carried out by 1978 IMA rules with plotting parameters. Mogessie, Tessadri, and Veltman (1990) came up with a Hypercard version of the earlier BASIC program (Mogessie and Tessadri, 1982) with the code name EMP-AMPH for Macintosh. Currie (1991) presented a BASIC program including the quantitative calculation of mol fractions of amphibole end-members. Tindle and Webb (1994) have developed a Microsoft Excel spreadsheet PROBE-AMPH program to calculate structural formulae of microprobe derived amphibole analyses and determine classification parameters depending on the IMA rules. Included with this program were published geobarometers based on the total aluminum content of certain calcic amphiboles.

In this paper a QUICKBASIC program, which is easy to use for amphibole formulae and nomenclature, has been written for IBM-compatible computers. The program with the code name AMPHCAL is created for the amphibole analyses obtained from the electron microprobe. Minor elements such as Cr, F, Li excluding Pb, Ni, Zn, Sr, and Ba are taken into consideration. For suitable calcic amphiboles, AMPHCAL calculates pressure values for geobarometers which are used extensively in recent years for calibrating the equations (Hammarstrom and Zen, 1986; Hollister and others, 1987; Johnson and Rutherford, 1989; Schmidt, 1992). For meaningful pressure values, that is smaller than 13 kilobars, this program also presents temperatures using the equilibrium equations of Blundy and Holland (1990).

AMPHIBOLE FORMULA CALCULATION

After evaluation of cationic values from amphibole analyses, the following procedures are carried out in order to constitute the tetrahedral (T), octahedral (C), M4 (B), and A (A) sites. These steps are given briefly by Leake (1978):