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M. GIUSTI, L. LEONI

X-RAY DETERMINATION OF Ab CONTENT IN K-FELDSPARS

Riassunto — La determinazione del contenuto di Ab nei feldspati alcalini viene fatta comunemente misurando al diffrattometro la posizione (2 o) del riflesso ($\bar{2}01$) su campioni macinati e omogeneizzati.

Utilizzando campioni di feldspato potassico provenienti dal granito dell'isola di Montecristo sono state eseguite misure su campioni di differente granulometria e omogeneizzati a temperature di 900°, 1000°, 1100° C. I risultati ottenuti indicano che la temperatura di omogeneizzazione migliore è di 1000° C circa e che la granulometria della polvere non ha nessun effetto sulla determinazione del contenuto di Ab.

Abstract — The determination of Ab content in K-feldspars by X-ray powder diffraction method utilizing the ($\bar{2}01$) peak requires a preliminary grounding and homogeneization of the samples.

Measures of Ab content in samples of K-feldspar from Montecristo (Tuscany) granite of different granulometry and at different temperature of homogeneization have been performed. The collected data suggest that the best temperature to homogeneize the phertite in natural K-feldspar is 1000° C and that the granulometry of the samples has no effect on the determination of Ab content.

INTRODUCTION

The molecolar content of Ab in K-feldspar is routinely determined, in petrographical investigations, by the method suggested by O. F. TUTTLE and N. L. BOWEN [1950] modified by P. M. ORVILLE [1963]. The method works very well, although some doubts may remain on its application owing to the fact that, apart from the homogeneization which is set to 1050° C by P. M. ORVILLE [1963], the experimental conditions of the measure are not standardized.

A survey of the petrographical literature show that the ORVILLE's calibration curve is utilized for specimens homogeneized in a large range of experimental conditions.

It seemed therefore useful to examine the results obtained in different experimental conditions and to compare X-ray and chemical data.

Experimental procedures

Specimens 6 and 7 of the Montecristo (Tuscany) granite (M. Giusti [1971]) have been used for this study. From each specimen two samples, containing more than 99% K-feldspars, have been prepared combining gravimetrical and magnetic methods of separation. The two samples represent respectively groundmass K-feldspars (G) and K-feldspar megacrysts (M). The homogeneization conditions investigated were: temperature of omogeneization, time of homogeneization, granulometry of the sample before homogeneization.

This last variable has been studied because in a very fine powder (as is necessary for X-ray powder diffractometry) from a microphertite it is possible to have the formation of grains containing only one of the two alkali feldspar phases. At the most it is sure that single grains of the powder have a composition randomly differing from that of the whole powdered K-feldspar crystal.

After homogeneization each sample has been carefully ground by hand in an agathe mortar. Chemical data has been obtained from partial chemical analysis of Na_2O, CaO, K_2O content.

Discussion of results

The results of the measures are reported in table1.

— With a 4h time of homogeneization the temperature has the effect to increase the determined Ab content from 900° C to 1000° C and then to lower this content from 1000° C to 1100° C.

— With a temperature of 1000° C the time of homogeneization from 4h to 7h has no effect (within the limits of the determination erros) on the determined Ab content.

— The granulometry effect has been examined only on a megacryst sample which give the possibility to homogeneize also fragments with dimension of about 0.5 cm. The granulometry

of the powder during the homogeneization has no effect on the determined Ab content.

TABLE 1

Experimental condition of homogeneization to determine the Ab contents in K-feldspars.

T (° C)	time of homegeneization	granulometry before homogeneization	Δ 2 o	(molecular) % Ab
sample 6 (G)				
900	4 h	very fine powder	0.89	18
1000	4 h	very fine powder	0.92	21.5
1100	4 h	very fine powder	0.88	17
sample 7 (G)				
900	4 h	very fine powder	0.90	19
1000	4 h	very fine powder	0.94	24
1100	4 h	very fine powder	0.895	18.5
sample 6 (M)				
1000	4 h	very fine powder	0.97	27
1000	4 h	70 mesh	0.96	26
1000	4 h	100 mesh	0.95	25
1000	4 h	grains about 0.5 cm	0.97	27
sample 7 (M)				
1000	4 h	very fine powder	0.985	28
1000	5 h	very fine powder	0.995	29
1000	6 h	very fine powder	0.99	28.5
1000	7 h	very fine powder	0.98	27.5

Figure 1 reports the results of a step by step measurement of the ($\bar{2}01$) K-feldspar peaks, from powder of widely differing granulometry (very fine powder is that produced by hand grinding in a agathe mortar).

The maximum intensities of the peaks are normalized to 100 but it is obvious that in the experiments the more broadened peaks have a lower height. All the peaks have the same mean position. The broadening is clearly due to the formation of an heterogeneus population of grains during the grounding before the homogeneization. The composition of the single grains are randomly distribuited around the mean composition of the whole ground crystal.

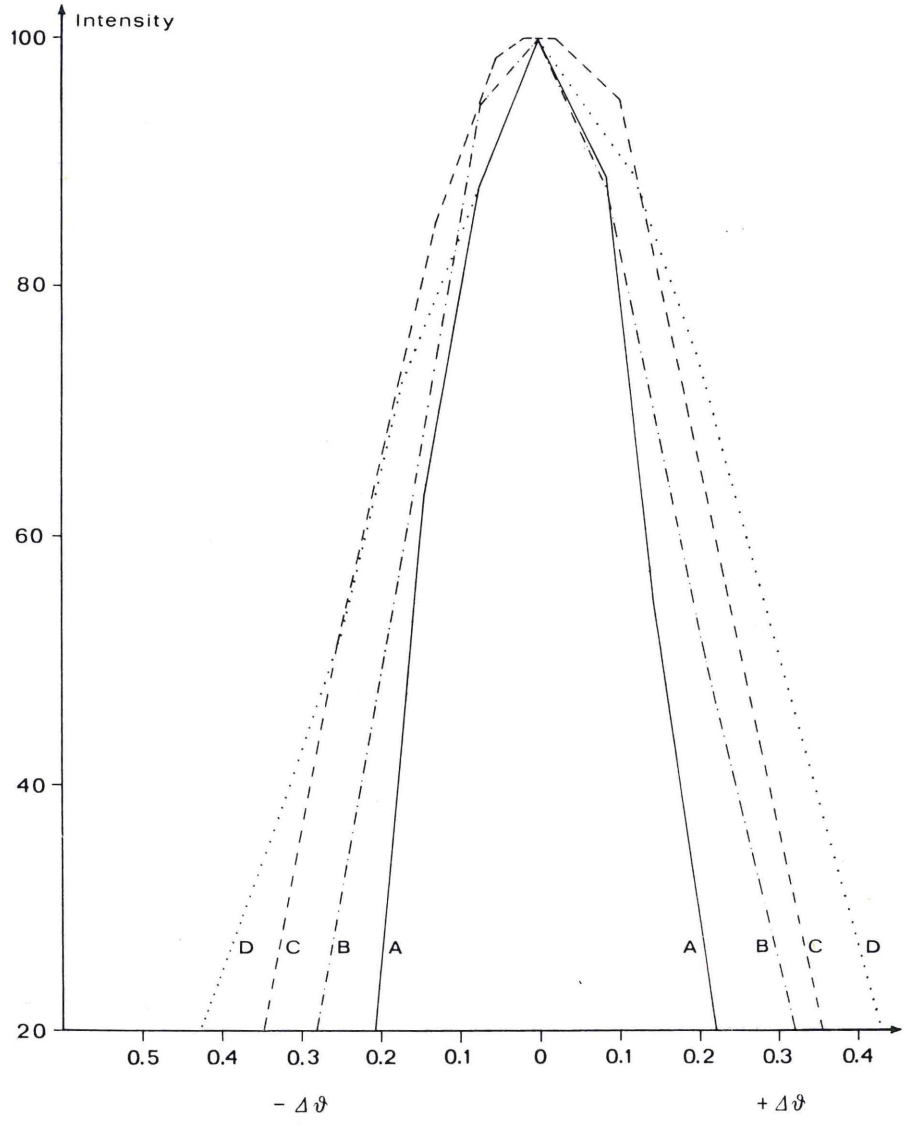

Figure 1 - Diagram showing the broadening of the ($\bar{2}01$) peak as a function of the dimension of the grains before homogeneization. A: grains of about 0.5 cm; B: mesh grains; C: 100 mesh grains; D: very fine powder.

Conclusions

From the collected data, and the comparison with the chemical ones, it seems that the better homogeneization conditions are the following:

— Temperature, 1000° C
— Time, 4h
— Granulometry, the greater possible with every specimen.

It appear that the granulometry before homogeneization has no influence on the determined Ab content. However it is always better to measure a well defined peak than a broadened one. Therefore we suggest to ground the specimens after homogeneization.

Table 2 reports for comparison chemical and X-ray data. The X-ray data are the arithmetic mean of all the data obtained at 1000° C.

TABLE 2

Comparison between chemical and X-ray data (molecular % of Ab)

sample	% Ab (X-ray)	% Ab (chemical)
6 (G)	21.5	20.4
7 (G)	24.0	23.0
6 (M)	26.3	26.2
7 (M)	28.5	28.6

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