Eur. J. M... al.
1993, 5, 677-678

A new technique for quantitative separation of quartz from feldspars

PAOLA IACUMIN* and CARLO QUERCIOLI**

*Istituto di Mineralogia e Petrografia, Università di Trieste, I-34100 Trieste, Italy
**Istituto di Geocronologia e Geochimica Isotopica, CNR, I-56100 Pisa, Italy

Abstract: This note describes a simple method for the quantitative separation of pure quartz from feldspars. This rapid and effective technique is particularly useful in the separation of silicate for oxygen isotope analysis and whenever high purity quartz samples are needed.

Key-words: mineral separation, HF etching, magnetic separation, pure quartz.

Introduction

The final separation used for obtaining pure quartz samples is usually carried out by hand-picking under the microscope. This is a time-consuming operation that requires a great deal of patience and may give unsatisfactory results because of uncertain identification of the phases.

The method of separation described here greatly facilitates the work by reducing the time of operation; it also yields an extremely good final result.

Procedure

The diamagnetic fraction obtained from a rock or sand sample is etched by HF (50%) at room temperature for 20–30 s. The sample is then carefully rinsed with water to eliminate residual acid. On etching the sample with hydrofluoric acid, silicon is removed as a volatile fluoride from the external parts of feldspar crystals, whereas no noticeable effects are produced on quartz crystals (Chayes, 1952; Bailey & Stevens, 1960). Observing the final product under the microscope, clear differences can be noted between quartz and feldspars, the feldspar surface being dull-white, rough and powdery, whereas the quartz appears clear and clean (Fig. 1). Very finely powdered pure magnetite (grain size $< 5 \mu$) is then mixed with the etched mineral sample and shaken in a closed vessel. Magnetite powder does not adhere to the smooth quartz crystal surfaces. On the contrary, magnetite powder easily adheres to the rough surface of feldspar crystals. The magnetite excess is easily removed by repeatedly passing a magnet over the sample, which is then repeatedly passed through a Frantz isodynamic magnetic separator, progressively increasing the magnetic field intensity. The diamagnetic quartz crystals are efficiently separated from the feldspar crystals, which behave as a paramagnetic mineral because of the adhering magnetite powder. Quartz crystals with small feldspar concretions behave as feldspar grains. The separated quartz fraction is almost 100 % pure (Fig. 2).

Practical example

– A diamagnetic mixture of quartz, K-feldspar and plagioclase obtained from a granitic rock is used (grain-size 60–120 mesh; about 2 g in weight).
– The mixture is etched with hydrofluoric acid (50 %), shaken at room-temperature in a plastic vessel for 20–30 s, repeatedly rinsed with distilled water and then dried by means of an infra-red lamp or in an oven.
– 100 mg of pure magnetite powder are prepared.
– The etched diamagnetic mixture and the magnetite powder are shaken together for 20–30 s in a polyethylene bottle (50 cc).
– The excess magnetite powder is manually removed by a magnet.
– The sample is passed three times (0.05 amps/15°; 0.5 amps/15°; 1.5 amps/3° through the Frantz isodynamic magnetic separator, using increasing magnetic field intensities, and various inclinations to eliminate the magnetic fraction.
– The diamagnetic fraction is washed with distilled water in an ultrasonic cleaner.

Slight modifications in the method as regards the magnetic field intensity, the separator inclination, the amount of magnetic powder may be used according to the shape and size of the mineral grains. Tests are currently being made to use the same technique on glass samples to separate devitrified glass from non-devitrified g... case, the sample is directly mixed wit... powder which penetrates the pores of... fied glass. Purities higher than about... been obtained.

0935-1221/93/0005-0677 $ 0.50

Fig. 1. Quartz (sm... and feldspar (rough... tals after etching... fluoric acid. The... 1 mm.

Fig. 2. Final result... ration procedure, a... pure quartz. The... 1 mm.

References

Bailey, E. H. & Stevens, R. E. (1960): Sele... of K-feldspar and plagioclase on rock ... section. *Am. Mineral.*, **45**, 1020–1025
Chayes, F. (1952): Notes on the staining of... spar with sodium cobaltinitrite in thin... *Mineral.*, **37**, 337–340.

Received 23 November 1992
Accepted 8 February 1993