FELDSPAR AND QUARTZ – GRANITES AND GRANODIORITES

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ABSTRACT

Feldspar is made up of a set of aluminium silicates combined with potassium, sodium, calcium and rarely barium. They are utilized in the glass and ceramic industries as a source of alumina and alkalis as well as fluxing agents. Brazil posses big reserves (over 50,000,00 t) but the granitic pegmatites are the main production source. These bodies are normally very irregulars so that the isolated reserves have small or medium dimensions. However, the depletion of natural ore deposits near the main consuming centers (São Paulo and Santa Catarina) and the difficulties of supplying and specifying consistent raw materials over time, as well as the growing mining and transportation costs, highlight the need to look for new alternative sources. Among the existing possibilities granites and granodiorites with coarse grains and with porphyritic feldspar crystals are to be noted. These rocks, when partially altered, lose their cohesion and can easily be deaggregated, yielding feldspar porphyries which can generally be recovered without difficulties. With this purpose, five granitic and granodioritic bodies from the south of Brazil, which in some places exhibit the characteristics the described above, were identified and characterized as the main subject of this work.

INTRODUCTION

The granitic rocks considered here are named and characterized as follows. Sorocaba granite (São Paulo State) is a porphyritic rock that exhibits a pink light colour, with tabular crystals containing potassium feldspar that reach up to 5 cm length. Its average chemical composition corresponds to 45% microcline, 20% plagioclase, 25% quartz and 10% biotite. Três Corregos granite (Paraná State) is a porphyritic rock with a light brown colour, rich in large potassium feldspar crystals with an average size of 5 cm. Its average chemical composition corresponds to 35% microcline, 30% plagioclase, 15% quartz and 20% biotite and hornblende. Valsungana granite (Santa Catarina State) is a porphyritic rock with light grey colour, rich in large microclinic crystals with an average size of 5 cm. Its average chemical composition corresponds to 45% microcline, 30% plagioclase, 15% quartz and 10% biotite. Pedras Grandes granite (Santa Catarina State), in the south-east portion of this great batolite is a predominantly porphyric rock of a light grey colour with tabular crystals of potassium feldspar that reach up to 3 cm in length. Its average chemical composition corresponds to 45% microcline, 30% plagioclase, 15% quartz and 10% biotite.

RESULTS AND DISCUSSION

Representative samples of each residual ore were collected in appropriate places and then homogenized and subjected to specific unitary operations. In a first stage, the ore was subjected to preconcentration, basically consisting of wet deaggregation, sedimentation and sieving, thus producing concentrates (materials)[1, 2, 3].

In a second stage, the preconcentrates were subjected to drying, crushing, grinding, sieving and magnetic separation, thus producing the final concentrates of feldspar, feldspar and quartz and feldspar quartz sand.

In this work the fine powders obtained in the preconcentration (<0.6 mm), as well as the resulting fine powders from the grinding process (<0.15 mm) were not evaluated since they did not present any practical interest.

The resulting final concentrates were subjected to chemical analyses and physical ceramic tests ("firing cone"), to evaluate their characteristics and behaviour with regard to their melting capability.

CONCLUSIONS

Critical analysis of the results found allows to drawing the following conclusions.

The characteristics and behaviour of the resulting final concentrates depend directly on the characteristics of the matrix rock which originated the residual ore.

The quartz amount present, as well as its particle size distribution, directly affects SiO_2 contents and hence concentrate melting behaviour.

The relative amounts of potassium feldspar and the sodium-calcium feldspar affect the relative contents of K_2O, Na_2O and CaO, significantly affecting the melting behaviour of the products. The minerals containing iron (biotite and hornblende) show significant

magnetic susceptibility, allowing concentrates with Fe_2O_3 contents lower than 0.20% and white colour after firing processes to be produced. Some of the feldspar concentrates obtained are useful for the glass and ceramic glaze industries. The concentrated feldspar and quartz, as well as the feldspar quartz sands can be used to formulate ceramic bodies for several applications.

At this point it is interesting to sign out that the obtained products are homogeneous mixtures composed of potassium, sodium-calcium feldspars and quartz with low iron contents. Moreover, the production processes enable obtaining significant amounts of concentrates with relatively low investment and operational costs.

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