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# THE ORIGIN OF GRANITES AND RELATED ROCKS

## FOURTH HUTTON SYMPOSIUM ABSTRACTS

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*Petrogenesis of the Mandira Granite*



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## PETROGENESIS OF THE MANDIRA GRANITE, FROM SÃO PAULO, BRASIL

José Moacyr Vianna COUTINHO<sup>1</sup>, Mirian Cruxen BARROS DE OLIVEIRA<sup>1</sup>, José Vicente VALARELLI<sup>2</sup>

<sup>1</sup>Instituto de Pesquisas Tecnológicas-IPT, Sao Paulo, Brazil (mlcout@mandic.com.br; miriancr@ipt.br)

<sup>2</sup>Instituto Geociências e Ciências Exatas – UNESP, Sao Paulo, Brazil (jvvala@usp.br)

The Mandira massif is a body of alkaline(A-type) granite covering an area of approximately 50 km<sup>2</sup> in the Administrative Region of the "Vale do Ribeira" in São Paulo, Brazil. It shows clear intrusive relations in spite of its concordant lensoid shape, whose longest axis (N 40° E) is also the regional structural direction, parallel to the coastal line. At N and NW, the country rocks belong to the gneiss-migmatitic Costeiro Complex, which is transitional to a syntectonic anatectic granite of the type Cantareira (porphyroidal). Ectinites of the "Complexo Turvo-Cajati" spring out of the NE end of the massif. A little farther W, granulites of the Serra Negra Complex emerge.

Three units are petrographically distinguished in the Mandira Granite:

(1) Acaraú (λA) is exposed as two stocks at the southern part of the pluton. It is a ferrohastingsite bearing mesoperthite granite;

(2) Mandira 1 (λM1) constitutes the main volume of granite in the massif and is composed of riebeckite bearing mesoperthite granite;

(3) Mandira 2 (λM2) occurs as four stocks implanted around the massif border. It is formed by rocks of syenogranitic composition. A few boulders of partially uralitized biotite gabbro were also found scattered over a meadow close to the northern part of the Mandira main body. A covered contact may occur at this site. Several zones in the granitic mass show the effects of late and postmagmatic processes: greisenization, albitization and K-feldspatization, sometimes associated with intensive hydrothermal action. Such regions were enriched with Zn, Pb, Mn, Cu, Fe, Sn and F in various degrees.

This research substantiates the present chemical, mineralogical and petrographical knowledge about the Mandira granite and was carried out by studies on bore hole core and surface samples. It also presents a hypothesis to explain the massif petrogenetic evolution, comprehending the intrusion and emplacement of the several granitic units.

The geological and geochemical data gathered here, indicate the following generative processes for the Mandira rock assemblage:

1- Ascent of a mantle derived basic magma up to the granulitic lower crust. It is worth mentioning that a granulitic belt has been mapped near the Mandira massif.

2- Cumulatic crystallization, liberation of latent heat of crystallization and partial fusion of the lower crust.

3- Generation of an anhydrous hypersolvus granitic magma.

4- Crustal contamination and crystallization of a basic magma at the base of the granitic body. The petrogenetic role of the basic magma comes to an end. The field survey detected biotite gabbro in a limited area of boulders scattered over a meadow, next to the W periphery of the massif.

The various magmas which were produced, ascended in a late to posttectonic period, some 500 to 600 Ma ago as diapirs formed in extensional environment related to rifting. The magmatic and post-magmatic events may be listed as follows :

5- Intrusion of λA stocks.

6- Formation of a subsolvus phase by one of several possible mechanisms.

7- Intrusion of the λM1 pluton.

8- Intrusion of λM2 stocks.

9- Intrusion of dikes and small irregular bodies of granite porphyry. This event is probably concomitant with early metasomatic processes such as greisenization and K metasomatism.

10- Development of fractures inside the cooled and almost totally crystallized granite body.

11- Convection of juvenile water, added to late meteoric water, throughout the fracture system.

12- Local hydrothermal alterations (e.g. carbonatization, silicification).