

# CRYSTALLIZATION PROCESSES IN GRANITIC PEGMATITES

## INTERNATIONAL MEETING

From Monday May 23<sup>rd</sup> to Sunday May 29<sup>th</sup> 2005



## FIELD TRIP PROGRAM (May 26-29, 2005)

The Field Trip Excursion will start on the afternoon of Thursday, May 26, and it will finish in the morning of Sunday, May 29.

This tour is intended to provide the participants with a general background of the Elba Island magmatism before focussing on the famous LCT pegmatite systems. Indeed, the Field Trip Excursion is devoted to three main topics, respectively: 1) overview of the Miocene magmatic rocks of central-western Elba; 2) structural relations between LCT pegmatites and hosting rocks; 3) classification and mineralogy of Elba LCT pegmatites.

### 1° Day – Thursday, May 26

The first part of the excursion is devoted to the overview of the Miocene magmatic rocks of central-western Elba, starting from the oldest unit (“Capo Bianco Aplite”;  $\approx 8.4$  Ma). In particular, the outcrop of “Capo Bianco Aplite” represents an interesting case of pegmatite-like magma emplaced at very shallow crustal levels.

*Estimated time of departure from Marina di Campo at 9:00*

We suggest the participants to dress in light clothes and boots with swimsuit underwear.

### ***Stop 1 – Capo Bianco, Portoferraio***

Visit to the outcrop of the B-F-Li-rich “Capo Bianco Aplite”, the oldest intrusive unit ( $\approx 8.4$  Ma) of the central-western Elba magmatic complex. It was emplaced as a thin sill ( $\approx 100$  m thick, 3.5 km wide) at very shallow crustal level ( $\approx 2.5$  km depth) into Cretaceous flysch. This rock is a peraluminous alkali feldspar granite; its high boron content is indicated by the widespread occurrence of tourmaline orbicules in sizes from mm to

many cm. The “Capo Bianco Aplite” is remarkable for its layered structure that is reminiscent of the “line” rocks frequently observed in aplite-pegmatite dykes.

*Arrival at 9:30 – Departure at 11:30*

### ***Stop 2 – Paolina beach***

It is said that this beach was the preferred by Paolina Bonaparte, the Napoleone’s sister. It is on the north-east edge of the Monte Capanne pluton and the outcrops are represented by thermometamorphic rocks (marbles, calcschists) crosscut by numerous leucogranite, aplite-pegmatite dykes. The dykes are mainly subvertical with a general N-S attitude. The northern part of the beach is rich in big boulders of aplites with tourmaline-bearing pegmatite showing spectacular “line-rock” structures. The exact position of the dyke that provided these boulders is unknown; the participants are kindly requested to discover it!

*Arrival at 11:45 – Departure at 12:30*

## **2° Day – Friday, May 27**

This part of the excursion is still devoted to the overview of the Miocene magmatic rocks of central-western Elba, up to the most recent products (the Orano Porphyry, 6.8 Ma). The outcrops visited in the second part of the day will be an introduction to the swarms of aplitic-pegmatitic dikes occurring along the eastern margin of the Mt Capanne pluton.

*Estimated time of departure from Marina di Campo at 9:30*

We suggest the participants to dress lightly with boots with swimsuit underwear.

### ***Stop 1 – Capo d’Enfola***

Visit to the outcrop of “Portoferraio Porphyry” and “San Martino Porphyry” respectively 8.0 and 7.4 Ma old. Sills and dykes of these monzogranitic units were intruded into a Cretaceous flysch sequence embedding and crosscutting the “Capo Bianco Aplite”. Both units are strongly porphyritic (sanidine, plagioclase, quartz and biotite phenocrysts). “San Martino Porphyry” is peculiar due to abundant sanidine megacrysts (3-10 cm in size).

*Arrival at 10:00 – Departure at 11:00*

### ***Stop 2 – Sant’Andrea***

The Monte Capanne monzogranite intrusion is a composite pluton made up of several magmatic pulses ( $\approx 6.9$  Ma). On the Sant’Andrea cliffs the more silica-rich facies is well exposed (Sant’Andrea Facies; it forms the NW part of the pluton) which is characterized by numerous orthoclase megacrysts (up to 15 cm) and quartz phenocrysts (up to 2 cm). This is the best area in Elba where it is possible to observe spectacular magma mingling/mixing phenomena between felsic and mafic magmas. The monzogranite outcrop is literally “infested” with a huge amount of tonalitic-granodioritic mafic microgranular enclaves that range in size from few centimeters up to two or three meters across. Both monzogranite and mafic enclaves are crosscut by a dark dyke of Orano Porphyry, a dominantly mantle-derived product ( $\approx 6.8$  Ma). This granodioritic-monzodioritic rock shows a peculiar mineralogy with olivine (replaced by chlorite), clinopyroxene (partially transformed into calcic amphiboles), phlogopite, hornblende,

Ca-plagioclase, Mg-chromite and allanite. The small dyke observed in this outcrop is part of a widespread dyke swarm that crop out in the NW sector of Monte Capanne.

*Arrival at 11:45 – Time for lunch and swim until 13:30 – Departure at 14:00*

### ***Stop 3 – Bontempelli quarry, San Piero***

Cava Bontempelli is placed in the SE part of the pluton where the more mafic “San Piero Facies” crops out. It is a medium grained homogeneous granodiorite-monzogranite that was actively quarried since Roman times (the pillars of the Pantheon in Rome), until now. This facies is characterized by the lack of early K-feldspar and quartz phenocrysts observed in Sant’Andrea (though not totally absent); these two minerals are late on the *liquidus* of the magma and cement the early plagioclase-biotite assemblage. Pseudomorphic cummingtonite aggregates replace former prismatic crystals of orthopyroxene. Several mm-cm spots and cloths of tourmaline are dispersed in the mass and are not related to late veining. Small tourmaline-rich aplite-pegmatite veins can also be observed.

*Arrival at 14:30 – Departure at 16:30*

### ***Stop 4 – Palombaia beach***

Descending the footpath to the beach we cross the east-dipping high angle fault that separates the non-metamorphic Cretaceous flysch of central Elba from the thermometamorphic aureole of the Monte Capanne pluton. Thermometamorphic rocks cropping out at the north edge of the beach are represented by metaserpentinites, marbles and pelitic hornfels which are crosscut by a network of aplite and leucogranite dykes (near the contact with the granite). Along these cliffs several hydrothermal quartz veins can be observed; in the past they were exploited by mineral collectors due to the presence of remarkable quartz crystals showing large fluid inclusions and rounded, “gummy”, terminations (named in the past “quarzi gommoidi”).

*Arrival at 17:00 – Departure when ready*

## **3° Day – Saturday, May 28**

This part of the excursion is devoted to the structural relations between LCT-type pegmatites and hosting rocks, and to the classification and mineralogy of the Elba LCT pegmatites. Some of the most famous classic localities for the production of elbaite crystals in the past and in recent times will be visited in the areas of the S. Piero and the S. Ilario villages.

*Estimated time of departure from Marina di Campo at 9:30*

We suggest the participants to dress in long sleeved shorts, pants and strong boots.

### ***Stop 1 – “Catri” and “Fosso Marcianella” pegmatite localities***

The itinerary starts at the parking area close to the “La Pila” locality. The group will walk along the watershed between the Marcianella and Gorgolinato valleys up to the locality of Catri. Along this walk, a complete section of contact metamorphic rocks (metasediments and later altered metaserpentinites) is exposed. A series of tourmaline-

bearing aplitic and leucogranitic dikes, locally with small pegmatitic veins, will be encountered.

At Catri, close to some abandoned magnesite quarries in altered serpentinites, the following pegmatite outcrops will be visited:

**The “Filone del Colle” pegmatite**

**The “Filone degli Scherzi” pegmatite**

**The unnamed altered pegmatite**

All such pegmatites are characterized by a geochemically highly evolved composition, with the presence of beautiful polychrome crystals of elbaite, pink beryl, Li-micas and petalite. The first two dikes are characterized by the presence of locally well developed aplitic “line rock”. The unnamed altered pegmatite has a mineralogy similar to the other two dikes but, open system condition during the latest stages of crystallization of the miarolitic cavities allowed the formation of large black heads at the termination of the elbaite crystals.

From the unnamed altered pegmatite, the group will go down the hill to south, for about one hundred meters, up to the “Filone dei Pastori” locality.

**The “Filone dei Pastori” pegmatite**

**The unnamed pegmatite hosted in altered serpentinites**

The Filone dei Pastori is characterized by a network of pegmatitic-aplitic veins crosscutting a granitic dike hosted in altered serpentinites. Such veins locally crosscut each other forming zoned pegmatitic pods with well developed aplitic “line rock” at the foot wall and a miarolitic geochemically high evolved pegmatitic hanging wall. Yellow-green elbaite crystals characterized by large acicular black heads (schorl-foitite), pale blue to pale pink beryl, altered petalite and pollucite, Li-micas, etc. were recently found at this locality.

Nearby the Filone dei Pastori, the remainings of an unnamed pegmatitic dike hosted in altered serpentinites, were worked in old times, outcrops. In the dumps of this pegmatite beautiful fragments of aplitic “line rock” can be found.

From Filone dei Pastori, the group will return back to the parking area walking along a path crosscutting a series of abandoned magnesite quarries. Before arriving at the parking area, close to an abandoned farm, a series of small outcrops of granophiric and tourmaline-bearing aplites and leucogranites will be encountered. At this place, one outcrop consists of very fine grained aplitite rich in tiny quartz-schorl orbicules.

*Arrival at 9:45 – Departure at 12:45*

***Stop 2 – S. Piero in Campo classic localities***

Some of the most important classic localities of the past for spectacular matrix specimens of elbaite and associated minerals, is located right at the south-eastern limit of the S. Piero village. During lunch-time, the group will have the possibility of walking over a distance of a few hundred meters looking at the remaining outcrops and dumps of the famous quarries of “Masso Foresi”, “Fonte del Prete” and “Facciatoia”.

*Arrival at 13:00 – Time for lunch until 14:00 – Departure at 14:30*

### ***Stop 3 – “Grotta d’Oggi” pegmatites***

Grotta d’Oggi is by far the most famous locality for elbaite specimens in Elba. At the locality mining started in 1825 with the discovery of a spectacular cavity lined with hundreds polychrome elbaite crystals up to 6-7 cm in length. Mining continued for some decades producing thousands of mineral specimens which were sold during the 19<sup>th</sup> century to museums all over the world. In the large granite outcrop remaining in the quarry, the narrow remnants of the 5 elbaite-rich pegmatites mined in the past are still visible. Mineral collectors, working in the large dumps, here discovered significant specimens and isolated elbaite crystals even in recent times.

Along the pathway for getting to the abandoned mine, some blocks of a petalite-bearing pegmatite, hosted in altered serpentinites, will be encountered.

*Arrival at 14:40 – Departure at 17:30*

### ***Stop 4 – “La Foce” cliff***

Large sills of the “San Martino Porphyry” extensively outcrop along the coast east of the town of Marina di Campo. From the “La Foce” locality, the group will walk to east for 15 minutes reaching a spectacular outcrop in which the erosion allowed the exposure of thousands of large and beautiful sanidine crystals. In this rock, small miarolitic cavities can contain small crystals of accessory minerals such as schorl, apatite, anatase, etc. Late-stage hydrothermal quartz veins locally contain amethyst crystals.

*Arrival at 18:00 – Departure at 19:30*

## **4° Day – Sunday, May 29**

This part of the excursion is still devoted to the structural relations between LCT pegmatites and hosting rocks, and to the classification and mineralogy of the Elba LCT pegmatites. The group will visit the famous “Rosina Dike”, discovered in 1992 in the classic area of “la Speranza” and “il Prado”, south-east of the S. Piero village.

*Estimated time of departure from Marina di Campo at 9:30*

We suggest the participants to dress in long sleeved shorts, pants and strong boots.

### ***Stop 1 - “Filone della Pineta” pegmatite***

This is a typical pegmatite vein hosted in metaserpentinites. The pegmatite, of limited size, is rich in schorl forming sprays and comb-textures, in whitish-pinkish mica and altered petalite. Cavities are frequent in the core zone, but they are of small size and much of them are of secondary origin due to corrosion of petalite masses. Accessory phases in cavities includes tiny crystals of vivid pink “apatite” and small green to pink elbaites.

*Arrival at 9:45 – Departure at 10:15*

### ***Stop 2 - S. Silvestro and the Rosina pegmatites***

The S. Silvestro and the Rosina pegmatites were discovered in recent times (respectively on December 1989 and on February 1992), by one of the organizers of this meeting

(F.P.), in a private property located close to the pegmatite-classic localities of “Il Prado” and “Cava Pisani” (this last known also as “Filone della Speranza”).

Despite the small size of the S. Silvestro, the Rosina dike is among the largest LCT aplitic-pegmatitic dikes ever discovered in Elba island. This dike is particularly rich in accessory phases, containing miarolitic cavities with geochemically evolved mineral assemblages, from the most primitive (schorl, foitite, blue beryl, ilmenite, euxenite and manganocolumbite), to intermediate (schorl, Fe-rich manganite, colorless beryl, spessartine, petalite, manganocolumbite and polycrase), to high evolved (elbaite, pink beryl, Li-micas, petalite, pollucite, microlite, manganotantalite, huebnerite, etc.). Limited mining activities made by F.P. and some collaborators are still going on at this place, removing little by little the pegmatitic rock to allow a complete three-dimensional sampling, documentation and study of the mineralogy and the rock structures of the dike.

*Arrival at 10:20 – Departure for Marina di Campo and end of the excursion at 13:00*