

in successive stages Li, Na, K. This sequence is the one observed during the differentiation of magnetic liquids following strictly the principles of crystal chemistry. When these geochemical results are correlated with the tectonic history of this over 200 km belt, it is found that tectonism and emplacement worked together during the evolution of the pegmatites. The partitioning of the alkali metals into phyllosilicates and tectosilicates frame works and the formation of rich muscovite books at one place and its absence from other places have been discussed in this paper. The wider applications of the present work in future prospecting techniques pertaining to lepidolite and muscovite have also been dealt with.

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SINGH R.P.* - *Geochemistry and petrogenesis of the granitic rocks occurring around Paraspani, Distt. Mirzapur, U.P. (India)*

The granites are heterogenous in composition and vary from type granites with dominating quartz and equigranular, allotriomorphic texture to adamellites containing mostly K-feldspar and plagioclase. The granitic rocks have been classified as:

- 1) Coarse grained Leucocratic granites.
- 2) Biotite granites with abundant quartz and subordinate microcline.
- 3) Syenite with dominant K-feldspar and abundant zircon and pale yellowish green biotite.
- 4) Biotite gneiss having fine to medium grained gneissic texture and mesocratic appearance.
- 5) Adamellite with approximately equal amount of microcline and albite and dominance of mafic minerals like biotite, and
- 6) Fine to medium grained biotite-granodiorite.

The chemical analyses of the granitic rocks have been given in Table, from which it is clear that these rocks show wide chemical variations. For example, silica varies from 69.53% in the biotite granodiorite to 74.41% in the granites, but the most conspicuous feature of the analyses is the alumina content, which is extremely low in most of the rocks. This has resulted into formation of acmite in the norm. Similarly, Fe_2O_3 and FeO show wide variation and the ratio Fe_2O_3/FeO shows significant change. In respect of the alkali metals in these rocks are very rich.

In the norm «or» molecule dominates over «ab» molecule in the adamellites, syenite and biotite granodiorite, while the «ab» molecule is more in the fine-grained granites as well as the typical granitic rock. The formation of hypersthene molecule denotes a general enrichment of the rock in Fe and Mg.

The oxide ratios given in Table also show conspicuous variations. The ratio SiO_2/MgO varies from 27.7% in the biotite granodiorite to 59.3% in the granites. The ratio CaO/Na_2O does not denote large variation indicating that the plagioclases occurring in these rocks,

do not vary in composition. The ratio Na_2O/K_2O appears higher in the granites than in biotite granodiorite and syenite. Such an abnormal behaviour is due to addition of K in all these rocks at a later stage connected with the metamorphic episodes. The chemical analyses have been plotted on a silica variation diagram. Some conspicuous features appear from a study of the point scatter obtained in this diagram. The first conspicuous feature relates to the segregation of the points along two silica ranges, one around 70% and other around 74%. The points do not indicate any such linear trend from which it may be established that these rocks are a product of differentiation. However, if the points for fine-grained granite and syenite are not taken into consideration, the resulting curves give a linear appearance. Taking into account that these rocks have been subjected to later metamorphic activities during which period besides, mineral re-constitution and alterations, addition of the alkali metals has also taken place, such a behaviour of the the curves obtained can be explained. From the chemical data as well as the resulting diagram the fact which becomes obvious is that the present granitic rocks are not metamorphic and initially they have been derived from an igneous parentage.

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SUARDI M.* - *The metalliferous mineralization of the Cervo Pluton (Biella)*

Rimin S.p.A. on behalf of the Ministry of Industry, is carrying out a large exploration programme to better define the metallogenic potential of the Triassic and Oligocene magmatism of the Alpine arc. As part of this programme, the Biella magmatic complex, with special reference to the Cervo Pluton, has been studied in detail, and the nature of metalliferous occurrence is being clarified.

Two mines are known to have been active in the area from the 17th century to the middle of the 19th century. The first, a copper mine (Ramoletti-Oneglie) was located 1 km south of the Cervo Pluton, in an area of andesites and andesitic volcanoclastics. The second, Sesslera (near Teggia l'Artignaga-Costa l'Argentera), lies 6 km to the north of the Ramoletti-Oneglie. This mine produced lead, silver and possibly gold, from the contact of the granite-monzolite pluton with the Sesia gneiss.

Between 1870 and 1940 prospecting and small scale exploration were carried out for Pb-Zn at Sassaja and S. Paolo Cervo, and for Mo at A. Machetto, C.ma Pietrabianca. These were located respectively within the granitic core, and at the synite-monzolite margin of the pluton.

Records show thus from 1950 vein occurrences containing Mo-U-W and Cu have been investigated. These occurrences were shown to be related to post cryxtalline brecciation of the intrusion and particularly of the syenite (at Bogna, Tomati, Orio di Mosso).

A preliminary prospecting programme carried out by Rimin S.p.A. has increased knowledge of the Cervo Pluton and allowed the subdivision of the mineralization as follow:

- Aplitic veins (at Tomati) and coarse quartz veins (at Machedto) containing pyrite, chalcocopyrite, pyrrhotite, powellite and bismuthinite are found within the syenite.
- Quartz veins and stockworks (at Sassaja) that contain zinc blende, chalcocopyrite, galena, pyrite and gold are found within a characteristic alteration of the pink porphyritic granite.
- Fine quartz stockworks, which have produced little alteration of the granite (at Campiglia Cervo) contain pyrite, chalcocopyrite, molybdenite and powellite. These are related to an intense brecciation of the core of the pluton.

The Mo-Cu occurrences (= W, Bi, and U) disseminated in the granite core, may be related to a porphyry-type model.

The Pb-Zn-Cu (Au) vein occurrences in or near the pluton, could be related to auriferous polymetallic analogous to that in the Traversella stock and at Tavagnasco.

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SUTTER J.F.*, MESSINA A.**, DE VIVO B.***
- $^{40}\text{Ar}/^{39}\text{Ar}$ thermal history of Hercynian
plutons in Northern Calabria (Italy)

A Hercynian plutonic complex ranging in composition from biotite-hornblende tonalite or granodiorite to two-mica Al_2SiO_5 (andalusite, sillimanite, cordierite) granite occurs in the Sila tectonic unit in Northern Calabria.

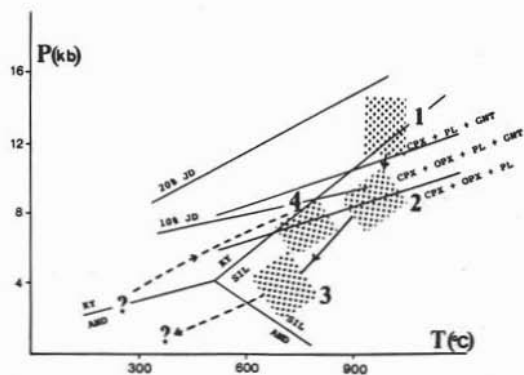
These plutons are both syntectonic (mainly biotite and biotite-hornblende granodiorite) and post tectonic (two-mica granite) with respect to Hercynian orogenesis. This Hercynian complex, together with its metamorphic country rocks, was tectonically transported from the southern continental margin of the Thethys to its present structural position during at least one stage of Alpine orogenesis. Previous geochronology suggests that mineral in the plutons variably retain their Hercynian history with many mineral pairs being only slightly age discordant suggesting that their ages are close approximations of the times of crystallization of the plutons. Potentially, $^{40}\text{Ar}/^{39}\text{Ar}$ age spectra of hornblende, muscovite, biotite, and microcline could elucidate the chronology of emplacement and Hercynian cooling history as well as any low-temperature thermal effects from Alpine deformation. Using the argon closure temperatures and the $^{40}\text{Ar}/^{39}\text{Ar}$ closure ages of these minerals, a time versus temperature plot for the Sila unit can be constructed. This thermal history will place constraints on both Hercynian and Alpine tectonism in northern Calabria.

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TRIBUZIO R.*, MESSIGA B.***, PICCARDO
G.B.*, VANNUCCI R.** - Primary characters
and polymetamorphic evolution of the
Archaean basement in the Angmagssalik
District (SE Greenland)

The Archaean basement in the Angmagssalik District consists of prevalent ortho- and para-gneisses, ultramafic and mafic (mainly amphibolite) rocks affected by later tectonic and metamorphic processes and intruded by relatively small amount of Proterozoic mafic dykes and syn-/post-orogenic plutons.

Orthogneisses have granodiorite compositions, while amphibolites, in spite of the effects of chemical mobility, show geochemical record of their magmatic protholites. In fact, some petrogenetically important major and trace elements indicate an overall transitional basalt composition of arguable affinity (ocean floor? island arc?). Trace elements (Ni, Cr, Y, Ti, Nb) display good linear correlation with Zr reflecting original igneous fractionation starting from a primitive high-MgO undersaturated magma.



Ultramafic rocks represent retrograde evolution of original spinel facies lherzolites and harzburgites.

Microtextural relations and mineral chemistry show significant variations in the mineral assemblage within the same rock-types due to metamorphic reactions.

According to the chemical composition of the different systems the main relations between the different assemblages in the different mafic rock types allow the following evolution to be reconstructed:

- 1) an early event under eclogitic conditions (Na-cpx + gnt assemblage) - STAGE 1;
- 2) a subsequent partial reequilibration under granulite facies conditions (cpx + opx + pl ± gnt) - STAGE 2;
- 3) a third event with incipient amphibolitization displaying coronitic textures (horn + pl as reaction rim between cpx and gnt) - STAGE 3;
- 4) a final event with pervasive transformation under amphibolite facies conditions (horn + pl assemblage) - STAGE 4.

P-T estimates for the above evolutionary steps have been determined according to recent experimental data on the pertinent system (see Fig. 1).