

subcrustal magma and a crustal component with a lower concentration of Sr and higher isotopic composition ($> .7105$).

The Sr I.R. of the granites (s.s.) is rather constant around .7100. This excludes the derivation of their parent magmas from a felsic crustal source (metasediments or metagranites), confining a hypothetical crustal protolith to intermediate or mafic rocks.

The Sr I.R. of mafic dyke of the Montorfano granite is similar to the lowest values of the Appinites, assuming an intrusion age of 290 Ma.

The disturbance of the Rb/Sr systematics, induced by the episyenitization of the «green granite» of Mergozzo, seems to be mostly due to removal of the alkaline element.

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BRIGATTI M.F.* , CASARI L.** - *Chlorites from cobalt-pyrite horizons. Upper Martello Valley (Alto Adige, Northern Italy)*

Chlorite occurs in the pyrite-rich phyllites and quartzites in a section cropping out around Rifugio Borromeo and included within Venosta Valley phyllite formation (Austroalpine crystalline basement).

The purpose of this investigation is to examine the usefulness of chlorite as petrogenetical indicator in this setting on the basis of systematic crystal chemical variations related to spatial distribution and mineral assemblages.

To this end, twenty selected samples were studied by microscopy, X-ray diffraction, thermal (TG and DTG) and electron microprobe (EDS and WDS) analysis.

Chlorite occurs as fibrous crystals in layers that consist of intergrowth with muscovite and/or chloritoid, or as disseminated crystals in the quartzitic groundmass.

X-ray study shows that the chlorite is structurally of the IIb polytype, intergrown with Ib polytype in some samples from chloritic schists in the upper section. This first is the most stable structure of relatively high temperature, the latter can be a metastable form of lower temperature. The presence of Ib polytype can indicate a lower grade process. Unit cell dimensions are closely linked to tetrahedral (c parameter) and to octahedral (a and b parameters) populations.

Chlorite chemical data show that all samples of Borromeo section are Fe-chamosite end members; they have a relatively close composition and are strongly affected by ore mineral assemblage, while the chlorites from neighboring phyllites are mostly Mg-rich.

BRIGATTI M.F.* , GREGNANIN A.** - *Crystal chemistry of igneous rock biotites*

A representative collection of 304 selected biotite analyses for 17 chemical variables (Al^{IV} , Fe^{IV} , Al^{VI} , Fe^{VI} , Mg, Mn, Ti, Li, Na, K, Rb, Ca, Ba, OH, F, Cl, Θ) were used to verify the existence of characteristic variation patterns in the crystal chemistry of igneous biotites in relation to geological setting and chemistry of parent magmas. To this end statistical analysis and chemographic methods were used. The collected biotites were grouped, with an «a priori» criterion, in volcanic types: rhyolites, rhyodacites and trachyrhyolites, dacites and trachytes, «andesites», trachybasalts and nephelinites and in plutonic types: granites, granodiorites, tonalites, diorites, «gabbros». No other groups could be defined owing to the shortage of analyses. Graphic methods substantially failed to give a clear distinction among biotites due to large overlap and the lack of a univocal interpretation, statistical analyses, on the contrary, showed strong chemical differences. Simple statistical equations and proper coefficients were found in order to evaluate the power of discrimination and to classify unknown biotites. The most important petrological factors which affect biotite chemistry are rock acidity, temperature of crystallization and probably rock alkalinity. Other factors, such as f_{H_2O} , f_{O_2} , and the presence of other Fe-Mg minerals, can cause more limited variations.

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BURLINI L.* , CAIRONI V.* - *The Quarna pluton (Serie dei Laghi, Northern Italy)*

The little Quarna pluton (about 3 square Km) intrudes the medium-high grade metamorphic rocks of the Serie dei Laghi near its tectonic boundary with the Ivrea-Verbano zone (Cossato - Mergozzo - Brissago line: CMB).

The country rocks are represented by intercalations of Cenerigneiss, Gneiss Minuti, amphibolites and orthogneisses, all partly remobilized (Strona-Ceneri zone; N, E, and S of the pluton) and by kinzigites, amphibolites and marbles (Ivrea zone; W of the pluton). In the country rocks microstructures suggest that two thermal events followed the main Hercynian regional metamorphism (about 320 Ma). The first one is connected with the basic intrusions (Appinite suite) occurring near the Cossato - Mergozzo - Brissago line and is represented by remobilizations of para- and orthogneisses within a distance of 2.5 Km from the CMB line, and by dehydration melting of $Ms + Qz \pm Bi$ at a distance > 2.5 Km. The second event is represented only by neoblastic biotite connected to an hypothetical thermometamorphism induced by the granitic intrusion.

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The mechanism of emplacement of the pluton is probably a cauldron subsidence (as for the other granites of the Serie dei Laghi), with fields evidences of a stoping mechanism on the topmost part of the stock.

In the Quarna pluton following rock types have been recognized from SE to NW: leucogranite (about 75% of the pluton), granodiorite (about 15%), quartz-diorite and gabbrodiorite (about 10%).

Field evidences show that the more leucocratic facies intrude the basic ones (appinites s.s.); weak thermometamorphic effects have been recognized in thin section. The granite is characterized by granoblastic aggregates of bi + pl + qz + ap + sphene \pm allanite, very similar to the typical structure of appinites.

Appinites and granite display major and trace elements variation trends suggesting their comagmatic character. The typologies of their zircon populations are also similar. They are indicative of calcalkaline magma with potassic affinity. The crystallization temperatures of zircon are in the range 850°-750° both for the appinite and the granite. The high zircon crystallization temperature in the granite can be explained by a low Pf in the magma, which is also supported by the very low frequency of hydrozircon overgrowths.

Geological, petrographical and geochemical data, together with zircon typologies, suggest an interaction between a basic magma (appinite) and crustal materials and/or differentiation processes in a deep magmatic chamber.

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CASTORINA F.*, **FARRIS M.***, **RETTIGHIERI M.***
- *Petrological and geochemical features of the Goceano plutonic complex (Central eastern Sardinia, Italy)*

The plutonic complex studied was intruded during the first phase of Hercynian orogenic cycle and constituted the central part of the Goceano ridge (Central eastern Sardinia, Italy).

The samples analysed are mainly composed by tonalitic - granodioritic rocks.

The samples, in the thin section, shows: quartz, plagioclase and biotite as principal constituents while K-feldspar, amphibole and chlorite are subordinated minerals: the accessory phases include: apatite, zircon, muscovite, titanite and more rarely allanite.

A series of characteristic diagrams are used to interpret the magmatic evolution of the plutonic bodies.

Particularly, it is possible to remark that all diagrams show the same trend; both Larsen and de LA ROCHE et Al. index display widely the same path like.

The following analyses give an example of chemical composition of the studied complex:

	BO 87	BO 161	BO 131
SiO ₂	58.64	64.61	68.22
TiO ₂	.69	.53	.37
Al ₂ O ₃	17.03	16.36	16.23
Fe ₂ O ₃ *	6.98	4.74	3.16
MnO	.12	.08	.07
MgO	4.68	2.63	.89
CaO	6.20	4.10	1.77
Na ₂ O	2.65	2.85	3.27
K ₂ O	2.06	3.25	4.61
P ₂ O ₅	.14	.12	.14
H ₂ O ⁺	.83	.72	1.28
Tot.	100.02	100.01	99.99

* Fe₂O₃ as Fe total.

Isotopic analyses are in progress for a better characterization of this investigated area.

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CATHELINEAU M.* - *U-Th-REE mobility during subsolidus alteration of peraluminous granites*

Accessory minerals such as monazite, uraninite, apatite and, at a lesser degree, zircon constitute the main mineralogical form of U-Th-REE in per-aluminous granites. Although their nature and distribution are controlled by magma features, they can be significantly affected by subsolidus alteration. Thus, different examples of quartz leaching combined or not with albization, from the southern part of the French Massif Central exhibit contrasted behaviour of trace elements and accessory phases. Observed changes are due to differential stability of primary accessory minerals (monazite and zircon) and crystallization of authigenic phases (complex solid solutions involving thorite, coffinite, apatite, xenotime, and zircon end members). P-T-X conditions of alteration are similar in the different occurrences: temperatures ranges from 450 to 350°C, fluids are aqueous and have low to medium salinities, fO₂ is high, and high F⁻, PO₄³⁻ activities are suspected (CATHELINEAU, 1987). Considering such conditions and the experimental data on solubilities, and speciation of U, Th, REE, the solubilization, transport and deposition of these elements appear to be mainly controlled by phosphate activity. U-Pb geochronological studies show that, in some albitites, they are close connection between magmatic U-Th-REE bearing phases dissolution (sources) and crystallization of authigenic phases in metasomatic rocks. At the contrary, in quartz depleted rocks, no time relation exists between reservoir rock formation (quartz depleted granite) and U-mineralization. However, in such deposits related spatially to quartz leaching, monazite in the nearby granite still plays a role as U and LREE source during the later hydrothermal, events which give the economic pitchblende ores, as evidenced from REE analysis, and Sm/Nd isotopic studies on ores and rock sources.

From a more general point of view, the effective