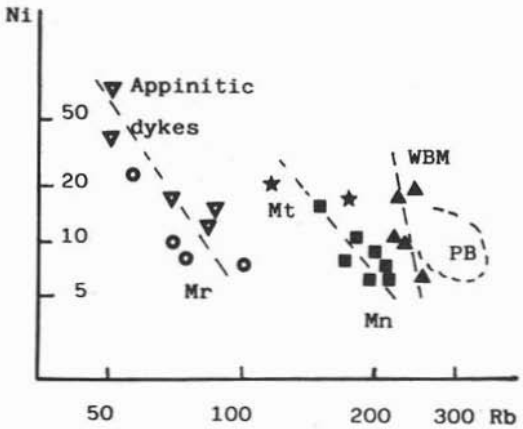

Fig. 2

HYGE distribution demonstrated that a simple petrogenetic model cannot account for the different intrusions. Diagrams based on incompatible and incompatible-compatible elements indicate that the

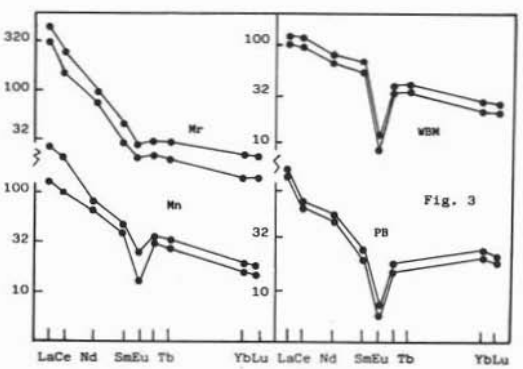

Fig. 3

different rock types cannot be related by fractional crystallization, nor indeed can all be related by different degrees of partial melting of a single source.

REE patterns for the different plutonic bodies are reported in Fig. 3:

— Mr is highly LREE enriched (La-Sm 400-35 × ch) compared to HREE (Tb-Yb 26-30 × ch) and displays high overall REE fractionation (La/Yb > 30) and no Eu negative anomalies;

— Mn is characterized by LREE enriched patterns (La-Sm 195-40 × ch; Tb-Yb 28-18 × ch); the La/Yb ratios range from 12 to 31 and the HREE patterns are significantly fractionated (Tb_N/Yb_N = 1.4-2.1); significant Eu negative anomalies appear (Eu/Eu^* = .3-.7);

— WBM shows moderate LREE enrichment (La-Sm 128-40 × ch) and slight HREE fractionation ($Tb_N/Yb_N \cong 1.2$), very low La/Yb ratios (6-8) and large Eu negative anomalies (Eu/Eu^* = .2-.4);

— PB is characterized by large Ce and Eu negative anomalies and Tb_N/Yb_N ratios < 1.

It is suggested that the distinct magma types underwent a complex history involving partial melting of different sources and crystal-fractionation (± assimilation) processes. The Mergozzo granite is tentatively related to the appinitic dyke intrusions during the pre-uplift period.

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Boriani A.**, Del Moro A.*, Giobbi Origoni E.**, Pinarelli L.* - *Rb/Sr systematics of the Hercynian plutonites of Massiccio dei Laghi*

The Late-Hercynian calcalkaline plutonites of Massiccio dei Laghi consist of conspicuous granite bodies and of row of dykes and stocks of basic-to-intermediate rocks, closely connected to the «CMB» (Cossato - Mergozzo - Brissago Line = tectonic contact between Serie dei Laghi and Ivrea-Verbano Zone). The latter are kindred of the Irish and Scottish «Appinites».

Four whole rocks sample of the Montorfano granite yield an isochron of 283 ≅ 14 Ma with a Sr I.R. = .7098 ≅ 5; this age is conformable, whithin the analytical error, to that measured on a biotite of the same granite. The age of the biotite from a granite porphyry dyke, cutting across the N contact of this pluton, is significantly younger (274 ≅ 8 Ma).

The muscovite of a pegmatite from Monte Zuccaro («CBM») yields an age of 259 ≅ 8 Ma, which is significantly lower (from the radiometrical point of view) than the ca. 279 Ma obtained on the same mineral phase in the high-grade country rock (kinzigite). The age of the biotite from the same kinzigite is ca. 213 Ma, whilst those from two Appinite samples of the same exposure are 196 ≅ 7 Ma.

The biotites from three Appinite samples of Valsesia (SW along the «CMB») give ages ranging between 214 and 240 Ma.

In the Alzo-Roccapietra granite, the biotite from Pella (W shore of Lake Orta) gives a Middle-Permian age of ca. 267 Ma, whilst those from a granite and a microgranite at Roccapietra (near the «CMB») give significantly lower ages of 216 and 233 Ma resp.

Ages older than 275 Ma, measured on whole rocks and on biotites, probably approach the intrusion age of the individual plutonic bodies. Instead, the mineral ages of the metamorphites and those of the plutonites near the «CMB» lower than 270 Ma, are clearly influenced by the post-Permian rejuvenescence of the «CMB».

Assuming a generalized intrusion age of 290 Ma and behaviour as a closed system for the Appinites of Monte Zuccaro and Valsesia, the calculated Sr I.R. ranges between .705 and .7105; the lowest values are those of the Monte Zuccaro samples.

The inverse relationship between the Sr I.R. and 1/Sr for both groups of samples, is in agreement with a model of magma genesis requiring interaction between a mafic

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 hypotetical 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 whithin Venosta Valley phyllite formation (Austroalpine crystalline basament).

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 clhloritoid, or as disseminated crystals in the quarzitic groundmass.

X-ray study shows that the chlorite is structurally of the IIb polytype, intergrown wiht 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 indiçate 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.

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BRIGATTI M.F.*, GREGNANIN A.** - *Crystal chemistry of ingeous 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 bioties 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 ± 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.