

BOIRON M.C.* , CATHELIN M.** -
*Contrasted behaviour of Au, and U in granites
 at the hydrothermal stage: the role of fO_2
 and pH*

Parts of the Hercynian belt in Europe give important metallogenic districts for Au and U. Most of the deposits were discovered in the vicinity of major shear zones (S.Z.): the South Armorican S.Z., the Limousin S.Z. (Arènes-Ouzilly, Bussières-Madeleine,...), the Marche-Combrailles S.Z. Mineralizations are located both inside granitic rocks and in the surrounding metamorphic rocks. In spite of numerous similarities (age around 280-315 Ma, presence of peraluminous granites, fluid circulation related to tardihercynian activity, temperature around 150 to 350°C.) location of Au deposits on one hand, and U on the other hand, is distinct. No U districts have produced significant amount of Au and vice versa. This spatial distinction may be related to the different source rock location respective to the two metals. However in many cases, potential source rocks of both elements are either observed together, in the vicinity of the deposits, or unknown. Thus, it has been considered that the hydrothermal stage is certainly a key in the understanding of the contrasting behaviour of U and Au, firstly because most of these deposits were formed under hydrothermal conditions. The purpose of this work was to investigate the role of fO_2 , fS_2 and pH and complexing agents as factors controlling the ability of hydrothermal fluids for transport and deposition of U and Au in granites, following the same approach than DUBESSY et al. (1987), for U and Sn-W.

a) In most of U deposits, pitchblende is associated with pyrite, or hematite + pyrite in the veins whilst the stable mineral assemblage in the host rocks is: quartz - muscovite - feldspars - hematite. Discrete crystallization of authigenic K-micas can occur before and/or during pitchblende deposition. Fluids are considered to be mostly aqueous, poorly saline, with a relatively low CO_2 content (≤ 0.5 moles %) which does not exclude otherwise significant amounts of carbonates in solution for U-transport. fO_2 is high and higher than that fixed by the hematite - pyrite - magnetite triple point. pH is probably nearby neutral.

b) In Au (As-Sb) deposits, two types of fluids may be distinguished (BRIL, 1983; HUBERT, 1986; BOIRON, 1987; and work in progress):

— high T (300-400°C) fluids which are in some cases aqueous, but more frequently belong to the CO_2 - H_2O (ϵ NaCl) system. In general CH_4 content is low;

— lower temperature fluids (150-250°C) which are dominantly aqueous, and poorly saline (Marche-Combrailles zone, BOIRON, 1987).

In most cases, strong K-mica (phengite, or illite) alteration occurs, which indicates a strong disequilibrium between fluids and host rocks, and rather low pH. fO_2 is low, but the frequent pyrothite instability during major Au-deposition, the low CH_4 content in the fluids, indicate that fO_2 is probably higher than the Ni-NiO buffer, and that fS_2 is high (join pyrite - arsenopyrite).

Thus, the fO_2 is probably higher than in Sn-W deposits for instance, where RAMBOZ et al., 1985, and DUBESSY et al., 1987 demonstrated low fO_2 around those fixed by the Ni-NiO and Q-F-M buffers.

Considering the experimental data on U and Au solubility (NGUYEN, 1985; SEWARD, 1973; HENLEY, 1973); and metal species in fluids, it is clear that under the above mentioned conditions U and Au cannot be mobilized and deposited together. U transport requires especially higher fO_2 values than those which are necessary for an effective solubilization of gold. On the contrary, pH under deposition conditions must be significantly lower in the case of Au than U.

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BONAZZI P.* , MENCHETTI S.* - *Contributo alla
 cristallografica dei minerali della serie
 ludwigite-vonsenite*

Sono stati esaminati campioni di ludwigite e di vonsenite raccolti nelle località di Corcolle (Roma), Brosso (TO), cave del Laghetto (Roma), Le Carcarelle (VT), Vulcano (ME), Montalto di Castro (VT), ed altri appartenenti alla collezione del Museo di Mineralogia di Firenze, le cui provenienze catalogate sono: Vesuvio, Libano, Vienna, Moravicza (Ungheria), Vaskö (Ungheria), Schlegeistal (Austria).

È stato effettuato tramite microsonda elettronica il dosaggio degli elementi metallici e sono state determinate le costanti reticolari tramite diffrazione di polveri

e/o diffrattometria a cristallo singolo secondo le caratteristiche e la qualità del materiale a disposizione.

Sulla ludwigite di Corcolle e sulla vonsenite di Le Carcarelle (purtroppo i campioni disponibili con composizione meno vicina a quella degli end-members non presentano cristalli singoli di buona qualità per la diffrazione) sono stati effettuati raffinamenti strutturali ($R = 0.025$ e $R = 0.020$ rispettivamente), che hanno permesso un più approfondito esame della distribuzione dei cationi metallici nei siti ottaedrici. Vengono discusse le relazioni fra composizione chimica e parametri geometrico-strutturali.

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BONIN B.* - *Petrological and geochemical aspects of the evolution of Evisa peralkaline complex (Corsica)*

Among the Permo-Triassic alkaline plutonic ring-complexes of Corsica, the most famous is perhaps the peralkaline complex of Evisa. Yielding an age of 245 m.yr. (Permo-Triassic boundary), it displays several cross cutting granitic intrusions. The first one is peraluminous (subsolvus biotite granite) but the others are more and more strongly peralkaline (agpaïitic index $Na + K/Al$ up to 1.25 with the presence of normative sodium disilicate): six cupolas, composed of hypersolvus arfvedsonite granite, are earlier than and some are intruded by a large body of albitic arfvedsonite-aegirine granite. They are surrounded or cut by spectacular dyke swarms (dolerites and peralkaline «paisanites»). At its northern part, Evisa peralkaline complex is introduced by another peralkaline massif, the Triassic Cinto-Bonifatto plutonic-volcanic cauldron.

The main concern when studying this complex is to discriminate between magmatic parageneses and post-magmatic mineralogical resettings. Modal data on light minerals and major element data are likely to represent magmatic features whereas dark minerals as well as Zr-bearing minerals have been proved to be highly sensitive to subsolidus reequilibrations.

Locally, strong fenitization processes around peralkaline dykes, inducing the crystallization of Ti-Zn enriched aegirine and arfvedsonite in a peraluminous biotite granite, evidence Na, Fe and F-rich hydrothermal fluids. Comparisons of fenitization-induced parageneses and granitic peralkaline mineralogical assemblage suggest that the whole complex has suffered a more intense subsolidus metasomatism by cognate hydrothermal fluids. Alteration processes are marked by removal of early prismatic zircon and late-stage precipitation of miarolitic elpidite and/or octahedral zircon, complete low-temperature super-ordering of alkali feldspars (maximum microcline and low albite) and incorporation of Li and F (no Cl) into arfvedsonite. Chemical zonations in arfvedsonite-riebeckite crystal and trace element data substantiate the role of F-rich hydrous mantle-derived fluids, carrying Na, Li, Fe, Ti, Mn, Sr, Th, HREE,...

These phenomena result in a complete Sr isotopic rehomogenization (initial ratio of 0.703).

The alkaline granitic series is composed of a metaluminous stock, followed by a peralkaline trend and a peraluminous one: the evolutions of their major and trace elements as well as isotopes display strongly contrasting behaviours, indicating different fluid compositions and/or thermodynamic conditions.

The question why the peraluminous trend is predominating in Corsica as well as in the Western Mediterranean province and why peralkaline complexes are restricted only to the latest magmatic events of this province remain unsolved and subjected to speculations.

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BORIANI A.*, CAIRONI V.*, ODDONE M.,
VANNUCCI R.*** - *Petrology and geochemistry of the Baveno-Mottarone and Montorfano plutonic bodies***

The Baveno-Mottarone and Montorfano plutons are late-post Hercynian multiple intrusions, consisting of various granite types distinguished on the basis of their mutual relationships and composition.

The analysed samples may be divided into the following main groups: in the Montorfano stock the main white medium grained biotite granite (Mn) rarely hornblende bearing and the «green granite» of Mergozzo

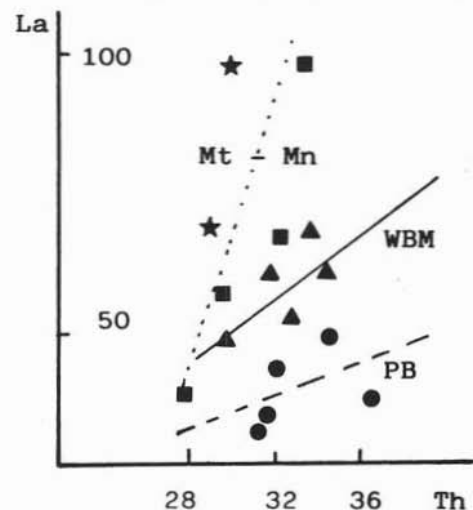


Fig. 1

(Mr); in the Baveno-Mottarone pluton the Mottarone granodiorite (Mt), a white medium grained biotite granite (WBM) and the pink miarolitic granite of Baveno (PB).

Major element chemistry suggests a calcalkaline affinity for most of the intrusions (Mn, Mr, Mt, WBM), whilst the pink Baveno granite, in spite of the intense late-post magmatic alteration, shows an aluminous alkaline character.