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CERRO HUEMUL: BITUMEN-HOSTED, SANDSTONE-TYPE U-Cu DEPOSIT, WESTERN ARGENTINA

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ABSTRACT:

CERRO HUEMUL: BITUMEN-HOSTED, SANDSTONE-TYPE U-Cu DEPOSIT, WESTERN ARGENTINA. Cerro Huemul is a stratabound, peneconcordant, sandstone-type, U-Cu deposit, classified as uranium deposit type 4.1.2. It is hosted by the Upper Cretaceous Diamante Formation, which is a continental fluvial unit characterised by high permeability sandy conglomeratic channels with intercalated mudstone units. Mineralization consists of a diverse suite of uranium, copper sulphide and gangue minerals which occupy a palaeochannel in the Diamante Formation at Cerro Huemul. All uranium and copper sulphide minerals are intimately associated with solid bitumen (migrated hydrocarbon). Petrographic studies of bitumens and ore species coupled with fluid inclusion analysis enable reconstruction of fluid flow through the Diamante Formation at Cerro Huemul. Mineralization is divided into three paragenetic stages and is integrated into a regional and deposit-specific genetic model for ore deposition.

Keywords: Cerro Huemul, bitumen, uranium, copper, sandstone-type deposit, Neuquén Basin.

YACENCIA DE YESO Y ANHIDRITA EN EL YACIMIENTO PORFÍDICO “BAJO DE LA ALUMBRERA” , CATAMARCA - ARGENTINA.

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ABSTRACT:

Gypsum and anhydrite are important at Bajo de la Alumbreira, as in many porphyry copper deposits in the world. Gypsum occurs in white thin veinlets of various orientations and it has a fibrous to platy habit. Gypsum veinlets are dissolved in the leached capping but also in several zones at depth since 200-300 m. In the deeper zones anhydrite is common as veinlets and disseminations. Both sulphates are not ubiquitous: they are most common in the andesite surrounding the main porphyry mass, apparently due to the higher original calcium content of the andesite.

Keywords: Gypsum, Anhydrite, Porphyry Cu-Au Deposit.

LA EXPEDICION MINERA DE ABRAHAM BECERRA (1887) A LAS MINAS Y BORATERAS DE LA PUNA SALTO-JUJEÑA

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ABSTRACT:

THE MINING EXPEDITION OF ABRAHAM BECERRA (1887) TO THE PUNA HIGH PLATEAU (SALTA AND JUJUY). In the year of 1887, the government of Salta province (Argentina) sent a mining expedition to the Puna high plateau. Abraham Alberto Becerra, a Chilean man, resident and married in Salta, was commissioned by the governor M.G. Güemes for a two-month trip to the “Western Cordilleras” in order to visit metallic and borate mines. At this time, following the Pacific War of 1879 between Chile against Peru and Bolivia, the Puna region was a conflictive territory and the mining properties were conceded at same time for different governments. The trip of Becerra was essentially geographic and economic with some defined geopolitical considerations. Becerra’s observations were rich in geological, mineralogical and metallogenic aspects. He made descriptions of gold placers, benefit metallurgical plants, silver, copper, antimony and other metals mines, borate deposits, thermal springs and some more points of interest. His knowledge of old mining terms, profusely used in the report proved that Becerra was a capable and empirical without academic geological studies. The paper, published as a booklet of 48 pages, was a pioneer work in the history of mining in northern Argentina and one of the scarce and values bibliographic referenced for the region in the nineteenth century.

Keywords: Abraham Becerra-History of Mining-Mining terms-Borate-Puna

CERRO JUNCAL: A PORPHYRY COPPER PROSPECT WITH AN UPPER EPITHERMAL SYSTEM

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ABSTRACT:

The Cerro Juncal area is located approximately 75 km southwest of the city of Salta. Other known projects in the area are Centenario, 10 km to the south on the same trend and Diablillos, which is approximately 50 km, also to the south of Cerro Juncal.

The porphyry outcrops on the western margin of an alteration zone measuring 4.5 km². The main alteration zone consists of Ordovician marine sediments, which display intense quartz-sericite alteration with limonite after pyrite. The intrusive can be traced in adjoining streams over an effective strike of approximately 900 meters. It has an exposed width of up to 200 m and it is covered in all directions either by colluvium, by the overlying altered Ordovician sediments or by their debris flow deposits.

The intrusive consists of a quartz-eye dacite porphyry with phyllic alteration and a later overprint of silica flooding. It has a well-developed quartz vein stockwork and is brecciated in places. The quartz veins are represented by both A and B types. The intrusive is leached with the oxides being jarosite, goethite and hematite, in order of abundance. The oxides occur both in the quartz veins and disseminated within the intrusive. Boxworks of pyrite and chalcopyrite can be observed. Massive limonite veins are fairly common in some sectors.

Although the area is mainly covered, it is believed that the porphyry is near surface. In addition, the altered Ordovician sediments have gold grades of up to 1.8 g/t, within low sulphidation epithermal mineralization overlying the porphyry system. There is a potential for copper mineralization and a secondary enrichment blanket in the porphyry, as not only do the oxide minerals in the leached intrusive indicate but also in the overlying leached sediments where copper has values of up to 456 ppm. This is concordant with the leached caps overlying some of the world's most important copper porphyries, such as El Salvador and La Escondida where copper values are up to 500 ppm and 300 ppm respectively.

Keywords: Cerro Juncal- gold- copper- porphyry

**ESCORODITA Y NATROALUNITA EN MINA CALEDONIA, DISTRITO CERRO BLANCO,
MARAYES, PROVINCIA DE SAN JUAN, ARGENTINA.**

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ABSTRACT:

SCORODITE AND NATROALUNITE FROM CALEDONIA MINE, CERRO BLANCO DISTRICT, MARAYES, SAN JUAN PROVINCE, ARGENTINA. The occurrence of scorodite and natroalunite in the Caledonia mine, Cerro Blanco District, Marayes, San Juan province, Argentina, is reported. The mineralogical characteristics of these minerals have been studied by X ray diffraction, thermal gravimetric analysis, differential thermal analysis, scanning electronic microscopy and EDAX analysis.

Keywords: Escorodite, Natroalunite, Marayes

ARGENTOPENTLANDITA DE MINA SALAMANCA: UNA NUEVA ESPECIE MINERAL EN ARGENTINA

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ABSTRACT:

ARGENTOPENTLANDITE FROM SALAMANCA MINE: A NEW MINERAL FOR ARGENTINA. This is the first reported occurrence of the mineral argentopentlandite $[\text{Ag}(\text{Fe}, \text{Ni})_8\text{S}_9]$ in Argentina. It occurs as exsolutions intergrown with mackinawite in a chalcopyrite matrix linked to sulfide mineralization located in a fault zone in Salamanca mine, province of Mendoza. Pentlandite and cobalt pentlandite are also present but associated to pyrrhotite. Its association to chalcopyrite and mackinawite, the last one carrying up to 7.5 wt % Ni and 0.7 wt% Co, indicates that the most plausible genesis for the argentopentlandite is by exsolution from a high temperature ISS which carried Ag and Ni.

Keywords: argentopentlandite - Argentina - mackinawite - ISS - ophiolite

GEOCROLOGIA Y EVENTOS DE BRECHIFICACION DE LA VETA POLIMETALICA VIZCAYA, SUROESTE DE ECUADOR

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ABSTRACT:

GEOCRONOLOGY AND BRECCIA EPISODES IN THE VIZCAYA POLIMETALIC VEIN SYSTEM. SOUTHWEST ECUADOR. Five magmatic-hydrothermal episodes have been characterized and identified during the polimetalic ore deposition in the Vizcaya system. They are related to breccia structures, hydraulic and depressuring process in a epithermal low sulfidation environment and the gold is related to milky quartz cement and jig saw textures.

Keywords: Zaruma Portovelo - low sulfidation epithermal vein - Post Miocene

NUEVOS HALLAZGOS MINERALOGICOS EN LA MINA LA MEJICANA, LA RIOJA, ARGENTINA

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ABSTRACT:

CONTRIBUTION TO THE MINERALOGICAL KNOWLEDGE OF LA MEJICANA MINE, LA RIOJA, ARGENTINA. Ore samples from the epithermal La Mejicana mine, La Rioja, Argentina, probably the type locality material of famatinite, were investigated by reflected light microscopy and electron microprobe analyses. The ore assemblage consists of pyrite, chalcopyrite, enargite, famatinite, different fahlores, polybasite/pearceite, electrum, acantite, uyttenbogaardtite and hübnerite, and svanbergite as alteration product.

Keywords. La Mejicana Mine, La Rioja- epithermal - famatinite - Stelzner

NUEVO APORTE SOBRE LA GEOLOGIA Y MINERALIZACION AURIFERA DE UN SECTOR DEL DISTRITO MINERO GUALCAMAYO, SAN JUAN, ARGENTINA

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ABSTRACT:

NEW CONTRIBUTION ABOUT THE GEOLOGY AND GOLD MINERALIZATION IN A SECTOR OF GUALCAMAYO MINING DISTRICT, PROVINCE OF SAN JUAN, ARGENTINA. This paper focuses on the mineral paragenesis and gold mineralization controls of the Quebrada del Diablo target area, located in the Gualcamayo Mining District, Eastern Precordillera, San Juan province. A very-fine grained disseminated mineralization is hosted by limestones, breccias and dacite porphyry and marbles. The metallic ore includes: native gold, cinnabar, pyrite, As-rich pyrite, marcasite, realgar, oropiment, sphalerite, chalcopyrite and galena. Barite, calcite and quartz are the common gangue minerals. Both structural and lithological factors control the ore distribution. The small size and the relatively uniform distribution of the mineral assemblage suggest that this deposit is similar to sediment-hosted gold deposits found in Nevada (USA) and China, as described by many authors.

Keywords: Eastern Precordillera - carbonate-hosted deposit - gold mineralization - paragenesis

EFFECTO TERMICO Y DEL AMBIENTE REDUCTOR SOBRE LA ESTABILIDAD DE UN MINERAL DE LA SERIE HEDENBERGITA-JOHANNSENITA

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ABSTRACT:

REDUCTION AND THERMAL EFFECTS ON THE STABILITY OF A MINERAL OF THE HEDENBERGITE-JOHANNSENITE SERIES. The reducibility of minerals belonging to the hedenbergite($\text{CaFeSi}_2\text{O}_6$)-johannsenite($\text{CaMnSi}_2\text{O}_6$) series from a skarn called "El Abuelo", province of Chubut (Argentina) has been studied by means of the temperature programmed reduction (TPR) technique with the aid of the "in situ" X-ray diffraction analysis up to 800 °C, in similar conditions to that of the TPR measurements. The characterization of mineral samples as well as the products of thermal treatments has been carried out by FTIR spectroscopy, SEM and EDAX microscopy, conventional chemical analysis and XRD analysis. The iron reduction of the structure leads to the segregation of metal Fe and the formation of johannsenite (Mn rich end member of the isomorphous hedenbergite-johannsenite-series) at 700 °C. Likewise, the johannsenite transforms to bustamite phase, structurally related to wollastonite. This process is favoured by the small difference between Ca(II)-Mn(II) size (in relation to that observed for Ca(II)-Fe(II)). The reduction behaviour has been also related to that observed in the wolframite system (Mn(II), Fe(II)) WO_4 .

Keywords: hedenbergite-johannsenite series, reducibility, thermal behaviour

HALLAZGO DE SULFUROS FRAMBOIDALES EN FUMAROLAS DE LA ISLA DECEPCIÓN, SHETLAND DEL SUR, ANTÁRTIDA

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ABSTRACT:

FRAMBOIDAL SULPHIDES FROM FUMAROLES OF THE DECEPTION ISLAND, SOUTH SHETLAND, ANTARCTICA. Pyrite frambooids have been recognized from fumaroles of the Deception Island, Antarctica. The sulphide was formed around reworked pyroclastic tephtras (lapilli). Mineralogical and geochemical studies gave microform characteristics and environmental conditions. Although the pyrite frambooid genesis was not completely dilucidated, it might suggest that it formed as a result of the reaction between the country rock and hydrogen sulphide.

Keywords: Pyrite, frambooids, fumarole, Deception Island, Antarctica

**MINERALOGY AND TEXTURES OF METAGABBROS AND ULTRAMAFIC RELATED
ROCKS FROM LA HUERTA AND VALLE FERTIL RANGES, WESTERN PAMPEAN RANGES,
SAN JUAN, ARGENTINA**

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ABSTRACT:

The eastern flank of La Huerta and Valle Fértil hills, Western Pampean Ranges, San Juan province, Argentina, mainly consists of metaigneous dioritic to granodioritic rocks that intruded the Proterozoic basement in the Early-Middle Ordovician (Famatinian Orogeny). Small bodies of metagabbro and related ultramafic rocks, up to a few hundred meters across, are present in minor amounts. Two-pyroxene metagabbros display well preserved igneous textures and mineralogy comprising Mg-Ca rich minerals: $Pl(An_{100-75})+Opx(En_{82-76}Fs_{18-23}Wo_{0-1})+Cpx(Wo_{50-46}En_{44-47}Fs_{6-8})\pm Ol(Fo_{83-75})\pm Spl\pm Ilm\pm Mag$. Abundant coronas composed of $Ol\pm Opx\pm Cpx\pm Am\pm Spl\pm Pl$ were developed at Ol-Pl boundaries. In this study, coronitic texture is interpreted as the result of slow cooling of the mafic-ultramafic bodies under high-amphibolite to lower-granulite metamorphic conditions. The peak of metamorphism in the area coincided with Corona formation and was related to the Famatinian intrusive activity. Later, the metagabbros were locally cut by narrow ductile shear-zones associated with mylonitization.

Keywords: Western Pampean Ranges-Famatinian magmatic arc-metagabbros-mineralogy-textures

APPLICATION OF PROVENANCE AND TECTONIC SETTING DIAGRAMS ON METAMORPHIC ROCKS: THE CASE OF METAMORPHIC UNITS FROM SIERRA DE SAN LUIS

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ABSTRACT:

APPLICATION OF PROVENANCE AND TECTONIC SETTING DIAGRAMS ON METAMORPHIC ROCKS: THE CASE OF METAMORPHIC UNITS FROM SIERRA DE SAN LUIS. Three of the metamorphic units of Sierra de San Luis (San Luis Formation, Pringles and Conlara Metamorphic Complexes) were analyzed from the perspective of protolith provenance and tectonic setting. This analysis, based on major element content, provided reliable results in the case of San Luis Formation. For the Conlara and Pringles Metamorphic Complexes the obtained results were considered as preliminary because the rocks display features which complicated a straightforward application of standard diagrams.

Keywords: Provenance - tectonic setting - metasedimentary units - Sierra de San Luis

FACIES DE ALTO GRADO DE LA FORMACIÓN CUSHAMEN EN AGUADA DEL PAJARITO, MACIZO NORPATAGÓNICO. PROVINCIA DE CHUBUT

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ABSTRACT:

THE HIGH-GRADE METAMORPHIC ROCKS OF CUSHAMEN FM. AT AGUADA DEL PAJARITO. NORTH PATAGONIAN MASSIF. CHUBUT PROVINCE. The metamorphic series of Cushamen Formation at Aguada del Pajarito are composed of biotite (\pm garnet) schists with interlayered amphibolites. Two ductile deformation phases are recognized, each accompanied by foliation development (S1 and S2). The second deformation is characterized by the development of the main foliation (S2) which is axial plane foliation of the relic F1 folds preserved in folded relic leucocratic veins. The observed equilibrium assemblages in both the schists and the amphibolites suggest amphibolite facies conditions for the climax of regional metamorphism which would have been synchronous with the second deformation. A later decompressive path could be inferred from reaction textures.

Keywords: Cushamen Formation - Northpatagonian Massif - metamorphic rocks

EXPLORACIÓN MINERA DEL PROSPECTO CERRO BLANCO (Au-Ag), SALTA, ARGENTINA. METALOGENIA SUBVOLCÁNICA NEOGENA CON DEPÓSITOS EPITERMALES DE ORO Y PLATA EN EL BASAMENTO DE LA PUNA ORIENTAL

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ABSTRACT:

MINING EXPLORATION OF THE CERRO BLANCO PROSPECT (Au-Ag), SALTA, ARGENTINA. NEOGENE SUBVOLCANIC METALLOGENY WITH EPITHERMAL DEPOSITS IN THE EASTERN PUNA. The Cerro Blanco subvolcanic-hosted epithermal (Au-Ag) ore deposit is located in the Salta-Catamarca Puna eastern border (25°16' Lat. S - 66°46' Long. W). The mineralization and alteration patterns on small bodies of porphyritic rhyodacites show a predominance of sericitic massive to silicified replacements, with minor feldspar-destructive kaolinite and alunite clusters. The host rocks are schists, quartzites and filites of the Metamorphic Rio Blanco Complex and the biotite granites and granitoids of the Oire Formation. Some very important hydrothermally brecciated bodies, also in little chimneys and dykes, occur into the metamorphic basement where the adjacent wallrock is highly silicified and frequently bleached. These altered and mineralized structures exhibit ductile deformation that is overprinted by later brittle faulting, both of which appear to be gold-related. There is a positive geochemical relationship between the precious metals (Au-Ag), As and the strong silicified rocks, where all evidence of primary lithological textures has been obliterated (i.e. brecciated quartz dikes, altered rhyodacites and quartzites, both with vuggy quartz in open spaces). A scarce sulfide ore assemblage characterized by pyrite, marcasite, chalcopyrite and minor covellite is mainly disseminated into the vulcanites and host rocks. Pure pyrite veins in stockworks outcrop randomly at the northeastern slope of the Cerro Blanco prospect. The epithermal gold deposit of Cerro Blanco is typically hosted in NNE-SSW trend along a Neogen volcanic belt. Several discrete gold-silver-bearing quartz-vein systems cut the Late Proterozoic - Early Paleozoic basement of the eastern Puna. The International Pacific Rim company surveyed through surface mapping and 218 trench-samples and rock-chip geochemistry. Also drilled eight boreholes, a total 1,973 m, on Cerro Blanco prospect. The estimated reserves are 18,499,250 t with 35,000 oz tr Au and 165,000 oz tr Ag and 5,300 t Cu fine. At present, the mining exploration shows a sub-economic target on profitable resources for gold and silver, but the metal contents in Cerro Blanco imply concentration factors of 28 for Au and 27 for Ag.

Keywords: Neogene subvolcanic metallogeny - epithermal precious-metal deposits - Cerro Blanco (Au-Ag) prospect.

KETTNERITA, CLINOBSIVANITA Y BISMUTITA DE LA PEGMATITA SD-2 (CÓRDOBA): DESCRIPCIÓN MINERALÓGICA Y CUANTIFICACIÓN DE LOS COMPONENTES DE UNA MEZCLA CON EL MÉTODO RIETVELD

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ABSTRACT:

**KETTNERITE, CLINOBSIVANITE AND BISMUTITE OF THE SD-2 PEGMATITE (CÓRDOBA):
MINERALOGICAL DESCRIPTION AND QUANTIFICATION OF COMPONENTS OF A MIXTURE
BY THE RIETVELD METHOD.**

A mixture of bismutite $\text{Bi}_2(\text{CO}_3)\text{O}_2$, clinobisvanite $\text{Bi}(\text{VO}_4)$ and kettnerite $\text{CaBi}(\text{CO}_3)\text{OF}$ (together with quartz and goethite) was found in the SD-2 granite pegmatite located near Tanti, Punilla Department, Córdoba province (Argentina). Its geographical coordinates are $31^\circ 21' 55,3''$ S, $64^\circ 28' 50,3''$ W. It is a zoned body composed mainly of quartz, microcline, plagioclase, biotite and muscovite, with Mn-rich fluorapatite, columbite-group minerals, spessartine, bertrandite, bismutite, kettnerite, clinobisvanite, goethite, abundant beryl, and very scarce rutile and zircon as accessory minerals. The three species are found intimately mixed with quartz and goethite in an opaque brownish yellow mass of $4 \times 2 \times 0.7$ cm, with earthy luster and conchoidal to irregular fracture. Kettnerite occurs as subhedral crystals up to 55 mm long embedded in finely granular bismutite. Clinobisvanite looks similar to kettnerite under the SEM but its EDS spectrum shows major Bi and V (with traces of Al and Fe). EDS spot analyses show Bi with traces of Fe and Si (bismutite) and Bi and Ca with traces of Al, Si and Fe (kettnerite). The Fe content is probably due to the goethite, and the Si detected reflects quartz in the mixture. The refined cell parameters of the bismutite, kettnerite and clinobisvanite are (in Å): $a = 3.877(2)$, $b = 3.878(2)$ and $c = 13.703(2)$ (for bismutite), $a = 3.804(6)$, $b = 3.799(5)$ and $c = 13.688(8)$ (for kettnerite) and $a = 5.238(9)$, $b = 3.149(8)$, $c = 11.735(8)$ and $\beta = 90.408(5)^\circ$ (for clinobisvanite). A quantification of the components in the mixture was accomplished using the Rietveld method. According to the refinement, the mass is composed of 67(1) % of bismutite, 27.6(6) % of kettnerite, 1.6(2) % of clinobisvanite, 1.4(9) % of goethite and 2.0(9) % of quartz. We want to stress the usefulness of the Rietveld method for the quantification of opaque and microcrystalline mixtures, which could not be done by other conventional methods.

Keywords: kettnerite - bismutite - clinobisvanite - quantification of a mixture - Rietveld method - pegmatite - Córdoba

BEUSITA EN LA PEGMATITA SAN JOSÉ N° 2, CÓRDOBA, ARGENTINA

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ABSTRACT:

BEUSITE IN THE SAN JOSÉ N° 2 PEGMATITE, CÓRDOBA, ARGENTINA. Beusite, $(\text{Mn,Fe,Ca,Mg})_3(\text{PO}_4)_2$, has been found in the San José N° 2 pegmatite (32° 09' 43,8'' S, 64° 56' 17,4'' W), Calamuchita department, Córdoba province (Argentina). It is a zoned body some 200 m long and between 15 and 30 m wide. Border and wall zones might be present but have not been observed. The pegmatite has an outer intermediate zone (plagioclase + quartz + muscovite) and an inner intermediate zone (quartz + plagioclase + muscovite or quartz + K-feldspar + muscovite). Accessory species include garnet, columbite-group minerals, gahnite and beryl. The core is composed of massive quartz. A single piece of beusite was found in the dump. It is massive, dark to medium brown and has a black rind of alteration products. Luster ranges from glassy on cleavage surfaces to greasy on fractures. $D_{\text{calc}} = 3.70 \text{ gr.cm}^{-3}$. Microprobe analyses (wavelength dispersive mode) are as follows (weight %, average of 3 points): P2O5 39.42, MnO 29.39, FeO 22.57, CaO 5.73, MgO 0.30, SiO2 0.01, F 0.00, Cl 0.00, total 97.42 wt. %. Indices of refraction are: $a = 1.704(3)$, $b = 1.708(3)$, $g = 1.722(3)$; $2V_{\text{calc}} = 28.3^\circ$. Dispersion $r > v$, strong; no pleochroism, $X = Y = Z =$ very light brown. Cell parameters are $a = 8.757(2) \text{ \AA}$, $b = 11.830(2) \text{ \AA}$, $c = 6.1603(5) \text{ \AA}$, $\beta = 99.81(1)^\circ$. Cell volume is $628.8(4) \text{ \AA}^3$. The diffraction lines match those of card 36-0401 of the JCPDS (1997).

Keywords: beusite - graffonite - granitic pegmatite - Comechingones - Córdoba.

ANÁLISIS ESTRUCTURAL DE LA VETA LA CLEMIRA, SIERRA DE AMBARGASTA, SANTIAGO DEL ESTERO

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ABSTRACT:

STRUCTURAL ANALYSIS OF LA CLEMIRA VEIN, SIERRA DE AMBARGASTA, SANTIAGO DEL ESTERO, ARGENTINA. A kinematic analysis from a manganese mineralized vein is given. This vein is part of a N-S fault system placed in the Ambargasta range. In this case the particular orientation (N 28° W) and dextral displacement allowed to consider this fault as a subsidiary shear fracture in Riedel's shear scheme. This model is associated to the main dextral shear meridian submeridian system, originated in the Pampeanas ranges during Cretaceous times which could be related to the whole continent extension.

Keywords: Pampeanas Ranges- mineralized system - dextral shear - Riedel's shear

TITANOMAGNETITAS EN ROCAS TRAQUIBASÁLTICAS DEL CERRO LAS LAJAS, DEPARTAMENTO MALARGÜE, PROVINCIA DE MENDOZA

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ABSTRACT:

BASALTIC ROCKS WITH TITANOMAGNETITES, LAS LAJAS HILL, MALARGÜE DEPARTMENT, MENDOZA PROVINCE. Las Lajas hill is situated in the southern area of Mendoza province, near of Neuquén province boundary. It represents a subvolcanic body made up of alkaline basic rocks (trachybasalts and basaltic trachyandesites), Eocen-Oligocen in age. These rocks have a high Fe-Ti oxide mineral contents (titanomagnetites and ilmenites) whose mineralogical and texture characteristics have been studied. These characteristics have allowed to identify initial oxidation stages of high temperature phase.

Keywords: trachybasaltic rocks - titanomagnetites - ilmenites - Mendoza

UPPER-AMPHIBOLITE FACIES MYLONITIZATION OF MAFIC-ULTRAMAFIC ROCKS AND GNEISSIC-MIGMATITIC COUNTRY ROCKS, SIERRAS DE SAN LUIS, ARGENTINA: IMPLICATIONS IN THE REMOBILIZATION OF ORE SULFIDES.

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ABSTRACT:

UPPER-AMPHIBOLITE FACIES MYLONITIZATION OF MAFIC-ULTRAMAFIC ROCKS AND GNEISSIC-MIGMATITIC COUNTRY ROCKS, SIERRAS DE SAN LUIS, ARGENTINA: IMPLICATIONS IN THE REMOBILIZATION OF ORE SULFIDES. Around mafic-ultramafic bodies of the Sierras de San Luis Central Block, a shear zone several kilometers wide was developed. Several authors have partially studied the mylonitic rocks as part of petrologic and/or structural works, but a great controversy exists among them linked to the timing and metamorphic grade at which this event occurred. On the other hand, a post-magmatic remobilization of sulfides±PGM of mafic-ultramafic rocks has been proposed in previous works. In the present contribution the attention is focused on the mylonitic deformation affecting mafic-ultramafic intrusives and their gneissic-migmatitic adjacent country rocks, both previously metamorphosed within the granulite facies. Physical conditions of deformation are evaluated through minerals deformation mechanisms, the construction of a suitable petrogenetic grid and internally consistent geothermobarometry. Considered together, deformation mechanisms in mafic-ultramafic (ol, opx, hbl and pl) and gneissic-migmatitic (pl, kfs and qtz) country-rocks, indicate a ductile behavior characteristic of very high-temperature deformation. The stability field for the country-rock mineral association in equilibrium during the mylonitization (Pl+Qtz+Kfs+Grt+Bt+Sil), indicate thermal conditions of deformation within the upper-amphibolite facies. Internally consistent geothermobarometry applied to this association in equilibrium with an H₂O+CO₂ fluid phase, constraints the conditions of deformation within the range 668-762 °C and 6.3-6.9 Kb at 0.29<XCO₂<0.72. Textural relationships in mylonites (distribution along foliation planes and crystallization within porphyroclast extension sites) clearly indicate that primary magmatic sulfide of mafic-ultramafic rocks, were remobilized during the mylonitic event. On the base of the obtained results and previous works in the area, a general discussion about the mylonitic event and related processes is raised.

Keywords: Sierras Pampeanas-mylonitization -P/T conditions-sulfides-remobilization

LOS ELEMENTOS TRAZA, LAS TIERRAS RARAS E ISOTÓPOS EN LA DETERMINACIÓN DE LA GÉNESIS DE CAOLINITA: EL CASO DEL YACIMIENTO LOMA DEL PIOJO, PROV. DE BUENOS AIRES, ARGENTINA.

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ABSTRACT:

TRACE, RARE EARTH ELEMENTS AND ISOTOPES IN THE KAOLINITE GENESIS DETERMINATION: THE LOMA DEL PIOJO DEPOSIT, PROV. DE BUENOS AIRES, ARGENTINA. In a vertical profile at the Loma del Piojo Kaolin deposit, the distribution of some trace and rare earth elements has been studied to verify their usefulness in understanding the origin of the clays. Chemical analysis were made on six samples that represent the alteration from the surface to a depth of 29 m. High contents in REE are found in the superficial samples whereas the intermediate and deepest samples have lower REE contents. The relationship La/Yb does not show any meaningful variation. An enrichment of REE with Ce and Nd highs is observed in the superficial and the more altered samples. The Winchester and Floyd (1977) graph is found useful for defining the argilized rock, while on the Dill et al., (2000) graphs only two samples fall within the supergenic kaolin field. The rest of the samples fall outside the classification limits. The $\delta^{18}O$ 18,8 to 20,0 and δD -62 to -78 isotopes indicate a weathering or supergenic origin for the kaolinite. The oxygen and hydrogen isotopes are conclusive with respect to kaolinite genesis whereas conclusions basic on the trace and REE elements should be weighted carefully.

Keywords: Loma del Piojo kaolin genesis.

PLATINOÍDEOS EN EL YACIMIENTO LAS AGUILAS, SAN LUIS, ARGENTINA.

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ABSTRACT:

PGM IN LAS AGUILAS DEPOSIT, SAN LUIS, ARGENTINA. Several authors have studied the Las Águilas deposit in San Luis Province, and established that the sulfide mineralization (pyrrhotite, pentlandite and chalcopyrite) and Platinum Group Minerals (PGM) are associated with the mafic-ultramafic rocks. But until the present paper, PGM in the metamorphic basement have not been identified. This contribution describes the presence of three kinds of PGM in samples from drill 5/4: platinum arsenides, platinum-palladium bismuthotellurides and palladium bismuthotellurides, present in mafic-ultramafic and in metamorphic rocks from the Las Águilas East deposit.

Keywords: PGM, metamorphic, mafic-ultramafic rocks, Las Águilas, Argentina.

ALTERACIÓN HIDROTHERMAL EN EL DEPOSITO DE ESTAÑO VIL ACHAY, CATAMARCA, ARGENTINA

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ABSTRACT:

HYDROTHERMAL ALTERATION OF VIL ACHAY TIN DEPOSIT, CATAMARCA, ARGENTINA. Hydrothermal alteration played a very important role in the Sn mineralization at Vil Achay deposit (Sierra de Fiambalá, province of Catamarca). The oldest rocks in the area are amphibolites belonging to the Fiambalá Gabbro (Ordovician). They are intruded by El Salto Granite of carboniferous (?) age. The mineralized granitic dike is hosted by amphibolites. Hydrothermal alteration in the granitic dike corresponds to albitization and greisenization. The greisen contains varying amounts of disseminated cassiterite. The following mineral sequence has been identified: cassiterite, magnetite, wolframite (scarce), chalcopryrite, pyrite, covellite, chalcosine, hematite, limonite, malachite and azurite. The genetic sequence can be divided into four stages: granitic dike setting, locally pervasive albitization, locally pervasive greisenization and mineral deposition. It is proposed that the deposit is part of a F-rich open greisen system during the late magmatic hydrothermal stage genetically linked to El Salto Granite.

Keywords: Sn deposit, hydrothermal alteration, Catamarca.

METASOMATISMO ALCALINO Y MINERALIZACION DE TIERRAS RARAS EN LA SIERRA DE SUMAMPA, SANTIAGO DEL ESTERO, ARGENTINA

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ABSTRACT:

ALKALI- METASOMATISM AND REE MINERALIZATION IN SIERRA DE SUMAMPA, SANTIAGO DEL ESTERO, ARGENTINA. Albite+aegirine+arfvedsonite+monazite alteration in granite and marble associated with epizonal, peralkaline and siliceous igneous dikes (comendites), provide an important example of Na- metasomatism and rare earth element (REE) mineralization in the Llamapampa area of the Sierra de Sumampa, SE Santiago del Estero. Early K-metasomatism (microclinization of magmatic feldspar) occurs in a few granite and comendite outcrops. Two generations of albite (Ab97.5-99) +aegirine (Ae88.5-96.6) ± Mg-arfvedsonite ± hematite ± fluor-rich apatite overprint the K-metasomatism and cross cut granite and comendite in outcrops within an 8 km² area. Late calcite veins and patches are ubiquitous. Locally, the Na-rich assemblage becomes pervasive and results in total destruction of host lithologies. Monolithologic and heterolithologic breccias with hydrothermal aegirine and chalcedony matrix are exposed at granite-marble-comendite contacts. Na- metasomatism in marbles produced banded and mottled aegirine (Ae96-97.7) ± Mg- arfvedsonite and multiple stages of secondary carbonates (calcite- Mn and Fe calcite-ankerite-Mn ankerite) associated with interstitial monazite (Ce>La) mineralization. Minor hematite, barite, celestine, sulfides (sphalerite, galene, pyrite, chalcopyrite) and quartz accompany the above alteration. The geotectonic environment and alteration style of Llamapampa are similar to the REE deposit at Rodeo de Los Molles, in San Luis province, except that REE mineralization in the later occurs in britholite-(Ce)+allanite-(Ce) (partially replaced by bastnaesite) assemblages located within a fenitized monzogranite.

Keywords: alkali-metasomatism, fenitization, albitization, comendite porphyries, REE-mineralization, monacite, Sierra de Sumampa

ZIRCÓN HAFNÍFERO DE LA PEGMATITA LA ELVIRITA, NEVADOS DE PALERMO, SALTA

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ABSTRACT:

HAFNIAN ZIRCON FROM LA ELVIRITA PEGMATITE, NEVADOS DE PALERMO, SALTA. Hafnian zircon from a rare-element, montebrasite-bismuthinite-microlite bearing pegmatite is studied. The mineral occur as paralell aggregates of simple {101} bypyramidal crystals with curved faces (EV2), that include platy albite and manganocolumbite, or with the same crystal form (EV8) associated with uranmicrolite in the core of an cm-sized bismuthinite crystal. The zircon crystals are unzoned and crystalline; its chemical composition show values close to 20 and 15 of HfO₂ wt% respectively corresponding to low temperature magmatic hafnian zircon.

Keywords: Hafnian zircon, rare-element pegmatite, El Quemado pegmatitic field.

THE ASSOCIATION QINGHEIITE-BEUSITE-LITHIOPHILITE IN THE SANTA ANA PEGMATITE, SAN LUIS, ARGENTINA

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ABSTRACT:

Qingheite, the Mg end-member of the wyllieite family of primary pegmatitic phosphates, with a formula $\text{Na}_2 \text{Na Mn}_2 \text{Mg}_2 (\text{Al,Fe})_2 (\text{PO}_4)_6$ and known so far from only the type locality, was discovered in a new occurrence and association. It occurs in Santa Ana mine (32° 53' 32" S y 65° 55' 43" W) in a beryl type, beryl-columbite-phosphate subtype of rare-element pegmatite. Qingheite occurs as 0.5-cm thick irregular granular veinlets or patches of deep jade-green color, in a nodule of beusite interlaminated with lithiophilite. The average of four chemical analysis gives PO₄ 45.19, Al₂O₃ 5.17, MnO 24.27, FeO 10.05, MgO 6.13, ZnO 0.18, CaO 0.51, SrO 0.02, BaO 0.02, Na₂O 9.22, K₂O 0.02, F 0.05, Cl 0.01, total 100.84. Assuming the same Fe³⁺/Fe²⁺ ratio and partition of cations as in the type specimen, the formula obtained gives (Na_{1.767} ~0.226 K_{0.004} Sr_{0.002} Ba_{0.001})_{2.000} Na (Mn_{0.901} Ca_{0.085} Na_{0.014})_{1.000} (Mg_{1.423} Fe_{0.277} Mn_{0.300})_{2.000} (Al_{0.949} Fe_{3+0.474} Zn_{0.021} Fe_{2+0.556})_{2.000} (PO₄)_{5.957}. Least-squares refinement of X-ray powder-diffraction data of qingheite gives a 10.900(2), b 12.420(3), c 6.433(1) Å, β 97.97 (2)°, V = 862.52(2) Å³. The host beusite has the formula (Mn_{1.733} Fe_{0.660} Ca_{0.412} Mg_{0.123})_{2.928} (PO₄)_{2.012} and a 8.790(3), b 11.475(2), c 6.156(2) Å, β 99.11 (2)°, V = 613.11(2) Å³. Lithiophilite composition is Li (Mn_{0.511} Fe_{2+0.299} Mg_{0.171})_{0.981} (PO₄)_{1.005} and a 6.063(2), b 10.324(6), c 4.712(2) Å, V = 294.94 Å³. The Santa Ana paragenesis is unusual and hybrid among the primary phosphate associations recognized by Moore and Molin Case (1974) in pegmatites where P and transition metals are available. In general, triphylite-lithiophilite series tend to predominate in Li-rich pegmatites, wyllieite and dickinsonite-arrojadite series are dominant in Na-rich pegmatites, and graftonite-beusite and sarcopside prevail in Ca-rich pegmatites.

PRESIÓN Y TEMPERATURA DEL SISTEMA HIDROTHERMAL DE LA VETA DE CUARZO PORTADORA DE MOLIBDENITA, ELSIREN, AGUA ESCONDIDA, MENDOZA, ARGENTINA.

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ABSTRACT:

PRESSURE AND TEMPERATURE OF THE HYDROTHERMAL SYSTEM AT THE MOLYBDENUM BEARING QUARTZ VEIN ELSIREN, AGUA ESCONDIDA, MENDOZA, ARGENTINA. Petrographic and microthermometric analysis of fluid inclusions at the molybdenum bearing quartz vein El Siren (Agua Escondida District) were done. Elsiren is located at the SE of the San Rafael Block (Mendoza). Two types of the microstructures in the quartz vein were found. In both shattering and recrystallization appeared but in one of them fluid inclusions could be used for thermometric measurements. In this type of quartz five kinds of fluid inclusions were recognized. The most abundant types were: a three-phase (H₂O liquid- CO₂ liquid and vapor), two phase (H₂O liquid and vapor) and a subordinate multiphase (with a solid phase). Fluid inclusions data indicated that there was neither evidence of fluid immiscibility nor of necking down. Minimum temperature of 340 to 380°C and 200 to 400 bars pressure were estimated during quartz formation. The main fluid is a CO₂ – H₂O fluid weakly enriched in Mo and the low amount of molybdenite precipitate was attributed to the lack of fluid immiscibility.

Keywords: Fluid inclusions - molybdenite - microstructure of quartz vein

PROSPECCIÓN FITOGEOQUÍMICA EN LA SIERRA DE NARVÁEZ, TUCUMÁN, ARGENTINA

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ABSTRACT:

PHYTOGEOCHEMICAL PROSPECTION IN SIERRA DE NARVÁEZ, TUCUMÁN. A phytogeochemical and lithochemical prospecting for Zn, Rb, Cs y Li was performed in metamorphic and granitic rocks in Sierra de Narvárez, southwestern Tucumán. Two kinds of plant species were sampled, one belonging to the Betulaceae family and the other one to the Poaceae family. A good correlation for Zn and Li between phytochemical and lithochemical profiles was found. The results suggest that the plants selected could be useful for mineral prospecting.

Keywords: Phytochemistry, lithochemistry, Narvárez hill, Tucumán

DETERMINACIONES MINERALÓGICAS EN LA FASE DE SULFUROS DEL DISTRITO MINERO CERRO ÁSPERO, SIERRAS PAMPEANAS DE CÓRDOBA

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ABSTRACT:

Mineralogical determinations within the sulphide phase at distrito Minero Cerro áspero, sierras pampeanas de Córdoba. The mineralogy of the sulphide-rich late mineralizing phase at Distrito Minero Cerro Áspero is updated. Reflected light microscopy combined with electron microprobe analysis have been used to determine the presence of altaite, wittichenite, miharaite and stannoidite within the sulphide assemblage of the district. Chemical analyses by electron microprobe are reported.

Keywords: Cerro Áspero - altaite - wittichenite - miharaite - stannoidite

HALOGENUROS DE PLATA EN VETAS EPITERMALES DEL SUDESTE DEL MACIZO DEL DESEADO

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ABSTRACT:

SILVER HALOGENIDES IN EPITHERMAL VEINS OF THE SOUTHEAST DESEADO MASSIF. This paper communicates the finding of silver halogenides in the Au-Ag epithermal quartz veins from the Cerro Moro and Buena Esperanza prospects, in the southeastern Deseado Massif. The minerals are chlorargyrite (AgCl), iodargyrite (AgI) and chlorargyrite-bromoargyrite solid solution (Ag(Cl_{0,75};Br_{0,25})) and they were detected by electron microprobe studies. This mineralogy occurs in the oxidized argentiferous veins from the southeastern Deseado Massif. It is typical of oxidized portions of silver deposits and could be present in similar epithermal veins of the Deseado Massif.

Keywords: Silver halogenides - epithermal deposits- Deseado Massif.

ESTUDIO ESTRUCTURAL Y GEOQUÍMICO DE LAS VETAS DEL DIQUE, ÁREA BUENA ESPERANZA, SUDESTE DEL MACIZO DEL DESEADO

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ABSTRACT:

STRUCTURAL AND GEOCHEMICAL STUDY FROM DEL DIQUE VEINS, BUENA ESPERANZA AREA, SOUTHEAST DESEADO MASSIF. The Buena Esperanza area is an epithermal low sulfidation occurrence from the southeastern Deseado Massif. It is located in the south part of a NW-oriented horst (Leonardo's Horst) and contains 18 quartz veins mainly hosted in La Golondrina Formation sandstones. Nine of these quartz veins belong to the Del Dique vein group and they have the most important precious metal anomalies. These veins, characterized by very poor outcrops and mainly consisting of floats (aligned fragments) of quartz veins, were mapped in detail and structural and geochemical studies were carried out in order to understand its behavior and predict the economical potential. Three directions (NNW, N5° and ENE) of fracturing and mineralization and its kinematic has been inferred from the detailed mapping. They are coincident with Buena Esperanza regional structure, in agreement with the extension produced during the opening of the South Atlantic Ocean by the end of Jurassic. Detailed geochemical studies allow to argue that fluid flow moved mainly from the edges (1 and 3 veins) to the Main Structure (2 and 9 veins), with three main concentrations zones (ore-shoots): the north, south and center of the Main Structure. The center and the edges of the Main Structure, specially in the fracture intersections, are highly prospective by concentration of low temperature (Au-Ag) metal precipitation. Also, potential to find Au-Ag bonanza mineralization in the Del Dique veins is inferred by the proximity with the La Golondrina and Bahía Laura volcanics unconformity and by the ore-shoot morphologies. The methodology proposed here could be applied to this type of "float veins", very common in Deseado Massif auroargentiferous province, where other type of studies (mineralogical and quartz textures) do not show important variations.

Keywords: epithermal veins - geochemistry - structure - Deseado Massif.

ALTERACION HIDROTHERMAL EN LA ESTANCIA “SAN ANTONIO”, (PROVINCIA DE SANTA CRUZ, ARGENTINA)

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ABSTRACT:

HYDROTHERMAL ALTERATION IN ESTANCIA SAN ANTONIO (Santa Cruz Province, Argentina). A petrographic study of the geologic unities and the characterization of the alteration minerals in Estancia San Antonio are here presented. Tuff, andesites and traquiandesites of the Bajo Pobre Formation, and ignimbrites of the Chon Aike Formation show intense alteration and quartz-hematite-adularia-calcite epithermal mineralization in veins, stockworks and hidrothermal eruption breccias of the low sulfidation style. A broad argillic alteration area is zoned outward to illite/sericite, illite/smectite, and smectite, with increasing distance from the breccias. Silicified ignimbrites horizon is believed to be generated in or inmediately below the paleo-water table. Acid-stable minerals as kaolinite, intimately associated with cristobalite, dickite and natrojarosite, are formed as a late stage steam-heated alteration overprinted to the shallow low-sulfidation environment.

Keywords: hydrothermal alteration - epithermal - low sulfidation

ESTRUCTURAS MINERALIZADAS EN EL CERRO CONTINUACION Y AREAS DE ALTERACION HIDROTHERMAL EN LA PENÍNSULA BYERS, ISLA LIVINGSTON, SHETLANDS DEL SUR, ANTÁRTIDA.

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** YPF - REPSOL

ABSTRACT:

MINERALISED STRUCTURES IN THE CERRO CONTINUACION, AND HYDROTHERMAL ALTERATION ZONES IN BYERS PENINSULA, LIVINGSTON ISLAND, SOUTH SHETLAND, ANTARTIDA. Sulfide mineralization and hydrothermal alteration are analyzed in relation to the tectonic - geological environment. Tectonic breccias hosted by Jurassic-Cretaceous marine sedimentary rocks shown pyrite, sphalerite and iron oxides in quartz and carbonate gangue, and zinc values up to 5053 ppm. Layers of anoxic black mudstones are shown replacements by diagenetic pyrite. Alteration assemblages are also present in several areas. The genesis occurs during the evolution of a backarc basin with subduction zone variable in the time, with volcanic activity related to intermediate magmas, between tholeiitic islandic arc and calcoalcalic magmas, since upper Jurassic to upper Tertiary.

Keywords: Livingston, Byers, mineralization, zinc, anomalies, hydrothermal, alteration

MINERALOGIA Y COMPOSICION QUIMICA DE LOS FILOSILICATOS DEL PORFIDO DE Cu CAMPANA MAHUIDA, NEUQUEN

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ABSTRACT:

MINERALOGY AND CHEMICAL COMPOSITION OF PHYLLOSILICATES IN THE CAMPANA MAHUIDA PORPHYRY CU DEPOSIT, NEUQUÉN, ARGENTINA. Phyllosilicates from different zones in the Campana Mahuida porphyry copper deposit have been analysed by electron microprobe analysis in order to understand spatial variations in mineral composition within the porphyry Cu alteration zones. The Campana Mahuida deposit is characterized by a central chlorite zone superimposed on the potassic core, and peripheral illite and smectite zones within the phyllic halo. In the chlorite zone, the chlorite octahedral cations vary between 11.2 and 12.19 per O₂₀(OH)₁₆ formula unit and the tetrahedral cation composition is between (Si₇Al₁) and (Si_{4,6}Al_{3,4}) with an overall composition of (Al_{1.9-2.5} Mg_{6.3-7.2} Fe_{2+ 2.3-3.2}) (Si_{5.3-5.8} Al_{2.2-2.7}) O₂₀(OH)₁₆. Thus, all are typical trioctahedral chlorites. Based on the Fe/Fe+Mg+Mn and Si contents, they are classified as Fe-Al clinocllore and Fe-clinocllore. The chlorite zone formed by destruction of hydrothermal biotite due to a K activity decrease, although chlorites have more Mg and less Fe than biotite. Surrounding the central potassic > chlorite zone is a phyllic zone dominated by illite (K_{1.2-1.9}Na_{0.1} (Al_{3.3-3.9}Fe_{0.1}Mg_{0.02})Si_{5.9-7.3}Al_{0.7-2.1}) O₂₀(OH)₄. Illite from vein centers and vein selvages has a composition close to muscovite, whereas disseminated illite in altered protholiths contains more Mg and Fe cations in the octahedral sites. A smectite-rich zone [(Al_{2.8-3.5} Mg_{0.3-0.9} Mn_{0-0.7}Fe_{0-0.6} Ti_{0-0.1})(Si_{7.3-7.9} Al_{0.1-0.7}) O₂₀(OH)₄ (Ca,Na,K)_{0.2-1.4}] occurs in the phyllic halo to the N and NW of the chlorite zone. Based on the structural formula, this smectite is of the aluminum montmorillonite-beidellite dioctahedral series. For these smectites, more than half of the charge originates in octahedral sites, with divalent cations, thus they are properly classified as montmorillonite. Surficial samples of this clay are Al-rich and interlayer cation depleted compared to montmorillonite from deeper zones. This likely resulted from intense leaching at low temperatures as is typical of a supergene environment.

Keywords: porphyry copper, hydrothermal alteration, illite, montmorillonite, chlorite

ANOMALIAS GEOFISICAS DEL SECTOR ORIENTAL DE LAS SIERRAS DE CANTANTAL Y GUAYAGUAS, PROVINCIAS DE SAN LUIS Y SAN JUAN

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ABSTRACT:

GEOPHYSICAL ANOMALIES IN THE EASTERN SECTOR OF CANTANTAL AND GUAYAGUAS RANGES, SAN LUIS AND SAN JUAN PROVINCES. There are no outcrops of the ultrabasic rocks of the Sierras de Valle Fértil and La Huerta to the south of this mountain range. In the Sierras de Cantantal and Guayaguas most of the outcropping units are sedimentary rocks of Mesozoic age with scarce or absent ultrabasic rocks. Two equipotential methods, gravimetry and magnetometry allowed us to recognize the continuity of these rocks in the plains but displaced 20 km to the East of the Sierras de Cantantal and Guayaguas. The size of these ultrabasic bodies which do not crop out is consistent with the recognized units in the Sierras de Valle Fértil and La Huerta. Their identification means that these rocks are extend from 31° 28' S (Marayes locality, San Juan) 32° 15' S (in San Luis province).

Keywords: Geophysical exploration-ultramafic rocks-structure-Guayaguas and Cantantal ranges

LOS CLINOPIROXENOS DE LAS VOLCANITAS ALCALINAS CRETÁDICAS DE LA SIERRA CHICA DE CÓRDOBA: SU IMPORTANCIA EN LA INTERPRETACIÓN DE LA EVOLUCIÓN MAGMÁTICA

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ABSTRACT:

CLINOPYROXENES FROM THE ALKALINE CRETACEOUS VOLCANIC ROCKS OF THE SIERRA CHICA OF CÓRDOBA: THEIR IMPORTANCE IN THE MAGMATIC EVOLUTION INTERPRETATION

An optical and chemical study of the clinopyroxenes from the alkaline rocks of the Sierra Chica of Córdoba has been carried out. Clinopyroxenes classify as diopside and augite, with more than 40% Wo, according to the alkaline nature of these rocks. Nevertheless, the majority of them are not titaniferous, with $Ti/Al < 0,5$. Mg contents of clinopyroxenes are high, even in those which belong to the more evolved rocks, so that a clear fractionation trend parallel to the diopside-hedenbergite join, typical of alkaline series, is not shown. Textures involving resorption and reaction with the liquid by some phenocrysts, together with chemical anomalies indicate frequent mixing between batches of magma. Specially, the increase of Mg from the rim of the phenocrysts to the groundmass microlites suggests recharge with more primitive magmas. Also, liquid immiscibility is attested by the presence of little ocelli in some samples, mainly formed by aegirinic clinopyroxene and alkaline felsic phases. Differentiation processes would have taken part under relative low pressures (<10 kb), in accordance with the AlVI contents (? 0,1). Si, Al and Ti contents and ratios fall in the compositional fields of clinopyroxenes of other potassic alkaline provinces as Paraguay oriental and the Roman Region (Italy).

Keywords: Córdoba - Sierra Chica - Cretaceous - alkaline basalts - clinopyroxenes

DIQUES BÁSICOS MINERALIZADOS (PB - ZN - CU) EN EL ALTO DE LA MINA, CATAMARCA.

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ABSTRACT:

MINERALIZED BASIC DIKES AT ALTO DE LA MINA, CATAMARCA, ARGENTINE. Basic dikes mineralized with Pb-Zn-Cu sulfides (galena, sphalerite, chalcopyrite, pyrite) -DBM- and quartz veins occur at the Alto de la Mina, Catamarca. The geology is constituted by pre-tectonic granitoids (Chango Real Formation, Cambrian?), intruded by specialized granites (Papachacra Granite, Carboniferous?). There are also barren dikes (DBE) and veins with wolframite and minerals of Bi near the granite - orthogneiss contact. Generally the deposits and polymetallic mineralizations of the Alto de la Mina are considered the product of hydrothermal activity related to the Stock El Portezuelo (Papachacra Granite), on the basis of petrographic and geochemical information. This paper deals with new geochemical evidence that indicates the presence of two types of mineralization, therefore a basic magmatic source for mineralizer solutions is considered for DBM dikes.

Keywords: geochemistry, polymetallic mineralization, Pampean Ranges.

EPIDOTO ROJO DEL PÓRFIDO CERRO DE LOS BURROS, SIERRA NORTE DE CÓRDOBA, ARGENTINA

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ABSTRACT :

REDDISH BROWN EPIDOTE FROM CERRO DE LOS BURROS PORPHYRY, SIERRA NORTE RANGES, CÓRDOBA PROVINCE, ARGENTINA. Moderate reddish brown epidote, easily mistaken in the field for grossular, was identified in mylonitized porphyries from Sierra Norte-Ambargasta ranges, near Puesto de los Caminos (29° 45' 41,3'' S; 64° 07' 13,9'' W). Vein and nodular styles of epidotization are frequently found affecting a dacite-rhyolite porphyry. Epidote-quartz nodules (@ 2 to 6 cm long) are elliptically shaped and compositionally zoned. Four main zones are distinguished from outer unaltered porphyry towards nodule center; zonation is characterized by an increasing degree of replacement of porphyry phases by fine-grained assemblages of greenish and yellowish members of the epidote - clinozoisite series, quartz, sericite, clay and opaque minerals. Drussy crystals of reddish brown epidote, scarce fibrous Ca-amphibole and minor titanite occur at the nodule core, included in anhedral quartz and minor vug-filling calcite. Reddish epidote occurs in crystals up to 3 mm long, in parallel and irregular associations. Identified forms are: { 0 0 1 }, { 1 0 0 }, { 2 0'1 }, { 1 0'1 }, { 0 1 1 }, and { 1 1 0 }. Some crystals show patchy color zoning along the b-axis, from yellowish green to reddish brown. Moderate pleochroism varies from light pink to yellowish green. Backscattered electron scanning and microprobe analyses show no compositional zoning. Average of five analyses yielded (in wt. %): SiO₂: 37.19, TiO₂: 0.076, Al₂O₃: 23.66, CaO: 23.43, MnO: 0.39, Fe₂O₃ (T): 13.00, absence of MgO and negligible percentages of La₂O₃ (0.03) and Ce₂O₃ (0.01), which are within known ranges for epidote s.s. Cell parameters computed from x-ray powder patterns are (in Å): a= 8.893 (s= 0.003), b= 5.635 (s= 0.002), c= 10.161 (s= 0.004), β= 115.39° (s= 0.03), cell volume= 460.1 Å³ (s= 0.2). These unit cell dimensions are highly similar to those of typical epidote; b is slightly lower and c is higher than equivalent parameters of piemontite. The low MnO contents of reddish epidote (0.31 to 0.52 wt. %) do not substantially influence the unit cell dimensions. The infrared spectrum is identical to that of epidote s.s. confirming the identity of the mineral species. Average of total Fe from microprobe data (as Fe⁺³= 0.78 a.p.u.f.) is in good agreement with Fe⁺³ computed from the infrared spectra (Fe⁺³= 0.73 a.p.u.f.). The origin of the red color remains unrevealed.

Keywords: red epidote- epidote replacement- mylonitic dacite-rhyolite porphyries- Sierra Norte- Córdoba.

BOURNONITA DE MINA LA CONCORDIA, LOS ANDES, SALTA

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ABSTRACT:

BOURNONITE FROM LA CONCORDIA MINE, LOS ANDES, SALTA. The composition of bournonite from the La Concordia vein, Los Andes department, Salta province (24°12' S - 66°24'W) was determined by EMPA. This mineral commonly shows a zonal distribution of Sb, As, Ag and Pb within the bournonite-seligmannite series of the crystal structure. The isostructural group shows two diadochic mechanisms that give rise to substitutional and interstitial solid solutions between Sb-As and Ag-Pb. Tabular, short prismatic and twinned on {110} idiomorphic crystals, up to 7 mm, have been found in quartz-druses at 5th, 6th and 7th mining levels of the La Concordia mine.

Keywords: Bournonite, La Concordia mine, Salta.

GEOLOGÍA Y MINERALOGÍA DE LAS ARCILITAS PRESENTES EN LAS ESTANCIAS LA ROSALÍA, SAN EDUARDO Y SIERRA DE LOS BARRIENTOS, PROVINCIA DE BUENOS AIRES

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ABSTRACT:

GEOLOGY MINERALOGY OF CLAY MINERALS, BUENOS AIRES PROVINCE ARGENTINA. Clay minerals production in Sierras Septentrionales of Buenos Aires Province is very significant (2.300.000 to 3.000.000 tn/year). These minerals are used in the manufacture of ceramic, refractory materials, etc. Clay deposits are seated within the sedimentary coverage of Tandilia System over the igneous-metamorphic basement called Complejo Buenos Aires. The studied area, located at the south of Tandil city, involves La Rosalía, San Eduardo and Sierra de Los Barrientos ranchs. The lithology survey description and sampling of pelitic beds were done in order to analyze the clays physicochemical and mineralogical characterization. Samples were studied by means of X-Ray diffraction, scanning electron microscopy (SEM-EDAX), FTIR spectroscopy and thermal analysis. Kaolinite, illite, quartz, feldspar, goethite and hematite minerals have been identified in pelitic beds of the studied area. The lithology and the mineralogical characteristics allow a preliminary comparison with precambrian pelitic units of Sierras Bayas Group and Ordovician Balcarce Formation, suggesting a possible homologation.

Keywords: Clay Deposits, Mineralogical characterization, Tandilia, Buenos Aires Province, Argentina.

ESTUDIO DE INCLUSIONES FLUIDAS DE LA MINERALIZACIÓN EPITERMAL DE SAN PEDRO-LA EVELINA, MACIZO DEL DESEADO, SANTA CRUZ.

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ABSTRACT:

FLUID INCLUSIONS STUDY OF SAN PEDRO-LA EVELINA EPITHERMAL MINERALIZATION, MACIZO DEL DESEADO, SANTA CRUZ, ARGENTINA..In this contribution we present the principal characteristics of an area with epithermal mineralizations located near to Estancias San Pedro and La Evelina, in the central part of the Macizo del Deseado. These mineral veins and veinlets, with high amounts of Mn, Fe, Sb, Tl, Hg and As, represent an ore type with only a few precedents in this geological province. The microthermometric analysis of quartz samples indicated salinities of 0,88 to 2,0 wt % NaCl eq. and temperatures between 135 and 180°C. The geochemical, mineralogical and microthermometric study reveal a structurally high position inside the epithermal system for these deposits.

Keywords: Macizo del Deseado-Fluid Inclusions-Epithermal Mineralization

**MOTTRAMITA - DESCLOIZITA EN UN YACIMIENTO DE CAOLIN DE LA ZONA SE DE LOS
MENCOS (Prov. de Río Negro)**

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ABSTRACT:

MOTTRAMITE - DESCLOIZITE OCCURRENCE IN THE SE OF LOS MENCOS KAOLIN DEPOSIT (Prov. of Río Negro). A mineral of the mottramite-descloizite series from the Blanquita deposit (Los Mencos, Province of Río Negro), was studied by means of X-ray diffraction, petrographic microscope and SEM-EDX analysis. The mineral occurs as well developed transparent crystals with bright yellow colours and yellowish surficial films. The kaolinic mineralization in Blanquita quarry occurred within the Sierra Colorada Formation (riolitic tuff).

Keywords: Mottramite - descloizite - kaolin

FIBROFERRITA EN MINA LA MEJICANA, LA RIOJA, ARGENTINA

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ABSTRACT:

Fibroferrite from La MEJICANA MINE, ARGENTINA. The occurrence of fibroferrite in the San Pedro vein, la Mejicana mine, Argentina is reported. The mineralogical characteristics of this hydrated basic ferric sulphate has been studied by means of optical microscopy, X ray diffraction, thermal gravimetric analysis, scanning electronic microscopy and EDS analysis.

Keywords: fibroferrite, La Mejicana.

TRIPLITA DE CERRO BLANCO, CÓRDOBA, ARGENTINA: ¿TRIPLITA O ZWIESELITA?

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ABSTRACT:

Triplite from Cerro Blanco, Córdoba, Argentina: triplite or zwieselite? A mineralogical research into the isomorphic series triplite-zwieselite of the Cerro Blanco pegmatite, using the classical methods of identification by X-ray diffraction, optical microscopy and wet chemical analysis, was performed with the aim of revealing the identity of this phosphate, which seems to be an intermediate member of the series. Triplite is a common accessory mineral in the Sierras Pampeanas pegmatites of Córdoba, San Luis, La Rioja and Catamarca provinces, and is very conspicuous in the El Gaucho and El Criollo quarries of the Cerro Blanco, Córdoba.

Keywords: Triplite, zwieselite, Cerro Blanco

INCLUSIONES FLUIDAS EN ESFALERITA DE LA VETA EL RECUERDO, DISTRITO CONCORDIA, SALTA

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ABSTRACT:

FLUID INCLUSIONS IN SPHALERITE FROM EL RECUERDO, PROVINCE OF SALTA. Fluid inclusions studies were carried out in sphalerite from El Recuerdo vein, Concordia District. All cavities have two-phase (L+V) fluid with H₂O+NaCl composition. V/L ratios are constant between 20 and 30%. The salinity is low to moderate, between 1,5 and 9 equiv. wt% NaCl. Homogenization temperatures in sphalerite fall within the range of 156-223°C and are consistent with those in gangue quartz. These temperatures are minimum precipitation temperature of the sphalerite but the real temperature is not higher. Salinity and temperature are characteristics of fluids in epithermal deposits.

Keywords: fluid inclusions - sphalerite - epithermal deposits

CARACTERÍSTICAS MINERALÓGICAS DEL SECTOR “VETA NORTE”. DISTRITO LA JOSEFINA. PROVINCIA DE SANTA CRUZ

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ABSTRACT:

MINERALOGICAL CHARACTERISTICS FROM “VETA NORTE” AREA. LA JOSEFINA DISTRICT. SANTA CRUZ PROVINCE. La Josefina District is defined as a low sulfidation type epithermal mineralization. The hypogenic assemblage is composed of arsenopyrite, pyrite, chalcopyrite, sphalerite and galena with freibergite inclusions within quartz, chalcedony and adularia gangue minerals. Overprinting the hypogenic assemblage, oxidation processes have taken place that removed the gold from the sulfides and have redeposited it as relatively coarse secondary high purity gold. Subtle variations of chemical composition of sulfides has been detected.

Keywords: mineralogy, epithermal mineralization, Au, Santa Cruz

HOT SPRINGS ACTUALES EN EL ÁREA INMEDIATA AL SUROESTE DEL DISTRITO MINERO CERRO VANGUARDIA, PROVINCIA DE SANTA CRUZ, ARGENTINA

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ABSTRACT:

ACTUAL HOT SPRINGS IN SOUTH WEST CERRO VANGUARDIA MINING DISTRICT, SANTA CRUZ PROVINCE, ARGENTINA. The purpose of the present contribution is to communicate the discovery of an active hydrothermal spring related to travertine accumulation located in south west square of Mine Concession of Cerro Vanguardia. Hydrochemistry study reveals that these are alkaline waters rich in Na-Cl-HCO₃; with a pH of 8,12 and an average contents of Ca, Mg, K and SO₄, with minorities concentrations of Li, Br, Rb, Sr, Y, Zr, Mo, Cs, Ba, As, Mn, Fe, Cu, Zn, Ti, Sc. These active hot springs can spill around 1 liter/minute of alkaline brines (Cl + HCO₃ > SO₄) solid residues of 8152 mg/Kg. Main characteristic above mentioned would allow us to homologate this hot spring to the mentioned in Bilran (Filipinas) and Broadlands (New Zealand). All of given information would support the first hypothesis about the presence of an active convective hydrothermal cells in the Deseado Massif, in Santa Cruz Province.

Keywords: Macizo del Deseado- hot springs- Quaternary

DISPERSION DE LAS SOLUCIONES HIDROTERMALES DEL DISTRITO MINERO CERRO ASPERO, PROVINCIA DE CORDOBA, ARGENTINA

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ABSTRACT:

Hydrothermal Solution Dispersion at Cerro áspero MINING DISTRICT, Province of Córdoba, ARGENTINE Hydrothermal solution circulation, responsible for ore mineral deposition and transformations such as changes in porosity and permeability, is analyzed at Cerro Áspero Mining District. Alteration patterns, petrological and structural elements together with geochemical prospective information are used to model the geochemical in dispersion the district. We propose that mechanisms of ore deposition are related to later episodes to the Cerro Áspero Batolith emplacement and have been controlled by high fluid pressure conditions, multiepisodic extensional stresses and preexisting basement structural discontinuities.

Keywords: Cerro Áspero ore deposits - structural controls - geochemistry - hydrothermal solutions

ANÁLISIS ESTRUCTURAL VINCULADO A LA ALTERACIÓN HIDROTERMAL DEL ÁREA DE LA ESTANCIA LA ESPERANZA, MACIZO DEL DESEADO, SANTA CRUZ

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ABSTRACT:

STRUCTURAL ANALYSES RELATED TO HYDROTHERMAL ALTERATION, ESTANCIA LA ESPERANZA, DESEADO MASSIF, SANTA CRUZ, ARGENTINA. At Estancia La Esperanza, central part of the Deseado Massif, the brittle deformation has been studied at different scales in order to reconstruct the palaeo-stress fields and their relationships with the epithermal mineralization. The lineaments have been surveyed using a mosaic of low altitude photographs at scale 1:18000. Additionally, field data from faults and joints have been obtained from five different areas: Cerro Tornillo, Cerro Guanaco, SSW vein structures and two other localities with no hydrothermal alteration. These results supported a principal stress from the NW. The Au and Ag mineralization was mainly located at structures oriented N-S.

Keywords: Deseado Massif - structural analysis - lineaments - epithermal systems.

ESPECTROSCOPIA INFRARROJA (FTIR) DE CUARZO EPITERMAL. CERRO VANGUARDIA, PROVINCIA DE SANTA CRUZ, ARGENTINA.

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ABSTRACT:

Infrared spectroscopy of epithermal quartz. Cerro Vanguardia, Santa Cruz province, Argentina. Infrared spectroscopy studies of natural clear quartz and amethyst from the Cerro Vanguardia District were carried out to analyze the crystallization of these minerals within epithermal veins. Different zones in an individual crystal were identified by cathodoluminescence (CL). Blue and yellow colors (CL), which are not permanent after a few minutes of radiation, are typical of these zones. Brown colors are typical of microquartz and clear quartz with zoning and defects. In blue-yellow (CL) types, water is present principally as a proton joined to an oxygen atom, and related to a cation (Li⁺). In brown (CL) varieties, water is present in fluid microinclusions. The content of H/106Si varies from 750 in the yellow quartz zone (CL) to 4000 in the blue quartz zone (CL). The limit between the zones has 2000 H/106Si. Amethyst normally has less than 100 H/106Si. The blue zones have different contents of aluminum that are attributable to differences in crystallization velocities and pH, during mixing in the epithermal system. Brown varieties of quartz represent pulses of boiling.

Keywords: Argentinian Patagonia - epithermal quartz - infrared spectroscopy

MARMOLES DE CONTACTO EN EL CERRO ALTO LARGO, COMPLEJO SUBVOLCANICO DE ULLUM, PRECORDILLERA CENTRAL DE SAN JUAN, ARGENTINA

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ABSTRACT:

CONTACT MARBLES IN THE CERRO ALTO LARGO, ULLUM COMPLEX, CENTRAL PRECORDILLERA OF SAN JUAN, ARGENTINA. The studied area is located in the eastern side of Central Precordillera, 30 km westward of San Juan. The geology of the area is characterized by a calcareous and detrital Paleozoic sequence overlaid by Cenozoic rocks and intruded by subvolcanic mesosilicic bodies. Marbles produced by contact metamorphism, outcrop in the area of cerro Alto-Largo and they are formed by calcite, wollastonite, garnet, brucite, periclase, chlorites and pyrite.

Keywords: Contact metamorphism. Marbles. San Juan Precordillera

COMPOSITIONAL AND STRUCTURAL CHARACTERISTICS OF K-FELDSPAR AND MUSCOVITE FROM THE LA VISTOSA PEGMATITE, SAN LUIS, ARGENTINA

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ABSTRACT:

COMPOSITIONAL AND STRUCTURAL CHARACTERISTICS OF K-FELDSPAR AND MUSCOVITE FROM THE LA VISTOSA PEGMATITE, SAN LUIS, ARGENTINA. La Vistosa is a zoned, almost barren pegmatite located at 32° 56' 12'' S and 65° 56' 56'' W, 5 km east of Paso del Rey, province of San Luis. It is placed in a discrete lens of leucogranite in the Totoral LCT pegmatite field, the southernmost of the Pampean Ranges. The geochemistry of trace elements, structural state, and cell parameters of the K-feldspar and muscovite studied from this pegmatite show variations related to (1) the type of pegmatite, (2) the internal unit of sampling, and (3) the history of crystallization. K/Rb ratios of K-feldspar vary from ~ 1000 in the parental host-rock to ~ 100 in the intermediate zone of the pegmatite and, at the same time, Cs varies from 6 to 160 ppm; triclinicity index increases from 0,73 to 0,95 in the same way. Muscovite shows similar fractionation of trace elements with K/Rb from 129-88 and Cs from 6-2200 ppm and increasing c dimensions in the 2M1 polytypes. Both minerals properly record the different evolution degree of each internal unit of the pegmatite.

Keywords: K-feldspar- muscovite- structural characteristics- composition- pegmatite- internal evolution

CARACTERIZACION MINERALOGICA Y QUIMICA DE LOS YESOS DE LOS YACIMIENTOS AGÜERO Y LUCIA, DEPARTAMENTO GENERAL ROCA, RIO NEGRO, ARGENTINA

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ABSTRACT:

MINERALOGIC AND CHEMICAL CHARACTERIZATION OF THE GYPSUM OF AGÜERO AND LUCIA DEPOSITS, DEPARTAMENTO GENERAL ROCA, RIO NEGRO, ARGENTINA. The Agüero and Lucía deposits represent a sequence of different evaporite levels accumulated during the Maastrichtian-early Paleocene (Allen Formation) located in the Neuquén basin, southwestern Argentina. The mineralization has been studied and characterized by several mineralogical and chemical techniques. Due to the high quality and volumetric concentration of its resources, both mines could be considered like two of the most important gypsum-bearing deposits of Argentina.

Keywords: gypsum- characterization- Fm Allen- Agüero and Lucía mines.

**WATANABEÍTA, $\text{Cu}_4(\text{As,Bi,Sb})_2\text{S}_5$, CON UNA NUEVA FASE MINERAL “ Cu_3AsS_3 ”
EN CERRO ATAJO, PROVINCIA DE CATAMARCA, ARGENTINA**

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ABSTRACT:

WATANABEITE, $\text{Cu}_4(\text{As,Bi,Sb})_2\text{S}_5$, AND UNNAMED “ Cu_3AsS_3 ” FROM CERRO ATAJO, CATAMARCA PROVINCE, ARGENTINA. Polymetallic ores from Triunfo, one of several hydrothermal veins at Cerro Atajo, contain abundant sulfosalts. Cerro Atajo is a subvolcanic deposit and is located in the Farallón Negro mining district, Andalgalá department, Catamarca province, Argentina (27°18'S - 66°28'W). Watanabeite is a rare constituent in these ores and commonly associated with aikinite, luzonite, annivite (the Bi-variety of tetrahedrite) and a compound optically resembling fahlore and chemically representing almost stoichiometric “ Cu_3AsS_3 ”. Watanabeite from Triunfo vein is optically close and chemically similar to the Japanese occurrence, but with an appreciable amount of bismuth. The ideal chemical formula can be given as $\text{Cu}_4(\text{As,Bi,Sb})_2\text{S}_5$, where $\text{As} > \text{Bi} > \text{Sb}$, thus representing a Bi-rich variety of watanabeite. This mineral from the Cerro Atajo epithermal system is the first mention for Argentina and represents the second world-wide reference of this very rare sulfosalt.

Keywords: Watanabeite, epithermal veins, Farallón Negro mining group, Catamarca

EVIDENCIAS DE MAGMATISMO TERCIARIO EN DIVISADEROS NEGROS, OESTE DE LA SIERRA DE VILGO, PROVINCIA DE LA RIOJA

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ABSTRACT:

EVIDENCE OF TERTIARY MAGMATISM IN DIVISADEROS NEGROS WEST OF SIERRA DE VILGO, PROVINCE OF LA RIOJA. The ultramafic alkaline volcanic rocks from Sierra de Vilgo, province of La Rioja, are characterized in this contribution. They crop out as small cones and diques in the southwestern margin of the sierra and are mainly composed of basalts with feldspatoids. These rocks are nefeline-normative, they belong to the basanite field of the TAS diagram and according to its $(Na_2O \cdot 2) / K_2O$ ratio, they can be classified as sodic. The age of these rocks is considered tertiary as a result of previous K/Ar studies.

Keywords: Alkaline basalts - Ocelli - Sierras Pampeanas - Tertiary

TEXTURAS DE OCLUSION FORMADAS POR EL “COPPER WAD” EN MUESTRAS DE PRUEBAS METALURGICAS DEL YACIMIENTO EXOTICO “EXTENSION NORTE MINA SUR”, CHUQUICAMATA, CHILE

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ABSTRACT:

MINERAL COMPOSITION OF COPPER WAD IN OCCLUDED PATTERNS OF METALLURGICAL SAMPLES FROM THE EXOTIC DEPOSIT OF EXTENSIÓN NORTE MINA SUR. Samples of metallurgical tests from the exotic copper deposit of Extensión Norte Mina Sur in Chuquicamata, including drilling cores, head and waste materials are characterized geometallurgically by optic microscopy, X ray diffraction, TEM, EMPA-EDAX. Exotic mineralization which includes crisocolla, atacamite, pseudomalachite, brochantite and copper wad, was deposited from acidic solution derived from lateral migration from the leached and supergene enrichment zone of the Chuquicamata deposits. The microscopic studies show that copper wad is easily remobilized forming occluded textural patterns in head and waste samples, filling fractures, cleavages and replacing formerly altered gangue minerals. Transmission electron microscopy analyses of copper wad show that copper wad has an amorphous structure intergrown with fibrous phyllosilicates. Electron probe microanalyses of copper wad revealed also a complex composition with Si, Cu, Mn, and Fe as mayor and Ca, Na, K, Cl, P, Pb, Zn and Ni as minor elements. The presence of copper wad occluded in waste samples does not appear to be negligible since it reaches up to 3% in volume.

Keywords: Exotic copper deposits, copper wad, geometallurgy

DISTRIBUCIÓN DE LAS ALTERACIONES EN LA MANIFESTACIÓN DE HIERRO DEL SKARN DE VEGAS PELADAS, SUDOESTE DE LA PROVINCIA DE MENDOZA

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ABSTRACT:

SKARN ZONATION AND FE-MINERALIZATION AT VEGAS PELADAS SKARN, SOUTHWEST MENDOZA, ARGENTINA The Vegas Peladas Fe skarn is located in the Cordillera Principal of SW Mendoza, in the Malargüe Thrust Belt. Mineralized skarn exposures show similarities with typical oxidized Fe skarn deposits worldwide. Skarn formation has particularly affected siltstone intercalated with mudstone and calcareous sandstone of Cerro Puchenque Formation (lower Jurassic) in the contact with diorite and gabbro-diorite stock (Los Molles Group; Eocene- upper Miocene). Diorite and gabbro-diorite stock margins exhibit different grades and types of alterations: magmatic amphibole, and feldspar patchy and vein replacement by amphibole ± chlorite ± calcite ± titanite ± magnetite and orthoclase ± epidote ± calcite ± clay. Along the contacts, replacement of diorite by quartz ± orthoclase ± epidote pervasive endoskarn overprints the above alteration and may result in complete destruction of the original igneous texture. The earliest alteration preserved in the sedimentary protholiths involve recrystallization of the siltstone, mudstone and calcareous sandstone to fine-grained pyroxene-rutile hornfels, and subordinate biotite-rutile hornfels; both are pyrrhotite rich. Hornfels are overprinted and veined by zoned exoskarn of irregular distribution. An inner garnet-rich zone is exposed at the porphyry contact, followed by an intermediate pyroxene - garnet rich zone; these prograde skarn zones are magnetite and sulfide barren. The early retrograde assemblage epidote ± amphibole envelopes magnetite-rich veins and pods that cross cut early hornfels and skarn zones. Later epidote ± quartz ± orthoclase ± pyrite are also present in minor amounts as late cross cutting veinlets and alteration products of hornfels and skarn.

Keywords: Cordillera Principal of Mendoza- Hornfels- Skarn zonation- iron mineralization

ASPECTOS PETROLÓGICOS Y GEOQUÍMICOS DEL COMPLEJO MAFICO- ULTRAMAFICO ESTRATIFICADO DEL CERRO LA COCHA, PROVINCIA DE CORDOBA, ARGENTINA

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ABSTRACT:

PETROLOGICAL AND GEOCHEMICAL DATA OF THE MAFIC-ULTRAMAFIC LAYERED COMPLEX CERRO LA COCHA, PROVINCE OF CORDOBA, ARGENTINA. The layered mafic-ultramafic Cerro La Cocha complex crops out in Sierra Chica, Punilla Department, Cordoba. It is located in a metamorphic complex formed by schists, amphibolites and marbles intruded by aplopegmatite dykes. The igneous complex is concordant with the regional structure. It is constituted by an intricate group of mafic and ultramafic cumulates with vertical zonation. Ultramafic cumulates with orthopyroxene can be seen at the bottom of the body; whereas those with ortho and clinopyroxene are placed at the top; gabbro cumulates crop out in the middle of the lens placed in the higher topographic levels. The tholeiitic character of this series is accompanied by conspicuous magnetite layers, chromite nodules and lenses. Presence of the all the PGE elements is restricted to the ultramafic cumulates and is strongly related to the petrographic and mineralogical composition; mafic cumulates only contains Pt and Pd. The layering is cyclic and rhythmic. This body would not belong to the ophiolite sequence of the Sierra Chica de Córdoba whose parental basaltic magma seems to fluctuate between ocean floor basalt or island arc sources. It may, instead, belong to the called "rift gabbros".

Keywords: Sierras Pampeanas, layered igneous complex, PGE

**TALCUSITA, $Tl_2Cu_3FeS_4$, EN LAS VETAS EPITERMALES DE MINA CAPILLITAS,
PROVINCIA DE CATAMARCA, ARGENTINA**

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ABSTRACT:

THALCUSITE, $Tl_2Cu_3FeS_4$, FROM EPITHERMAL VEINS AT CAPILLITAS MINE, CATAMARCA PROVINCE, ARGENTINA. Thalcusite, $Tl_2Cu_3FeS_4$, is reported in an epithermal subvolcanic vein-type deposit. It was found in bornite-chalcocite-rich samples from old dumps near the Rosario vein, at the Capillitas mine, Catamarca province, Argentina ($27^{\circ}21'S - 66^{\circ}23'W$), where it occurs as small inclusions in bornite and chalcocite. Others associated minerals are tennantite, wittichenite, and two possibly new germanium phases. Generally, thalcusite forms tabular grains up to $260 \times 35 \mu m$ with a very good parallel cleavage, weak reflection pleochroism in shades of grey (colour change from pinkish grey to brownish grey) and strong anisotropism between yellow, yellowish grey and bluish grey colours. Several polished mineral sections using EMPA were analysed and thalcusite from Capillitas is close identical with the ideal formula. It is the first mention of the thallium-copper-iron sulfide for Argentina and the first world-wide occurrence in an epithermal deposit.

Keywords: Thalcusite, epithermal polymetallic veins, Neogene Andean subvolcanic ores, Capillitas mine, Catamarca.

NUEVOS HALLAZGOS DE ROCAS BÁSICAS ALCALINAS EN LA PROVINCIA DE SAN LUIS

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ABSTRACT:

NEW ALKALINE BASIC ROCK OUTCROPS IN THE PROVINCE OF SAN LUIS. In the granitic environment of the Sierra de San Luis was found out three new outcrops of alkaline basic rocks. They are basanite and trachybasalt and their outcrops suggest that they would correspond to a single eruption and they would have formed monogenetic cones but they had not kept up to the present. The petrography and geochemistry show clearly alkaline characteristics and they make it possible to classify the rocks as transitional to a potassic serie. Their trace elements and REE contents allow us to support a low grade of melting from an enriched lherzolitic mantellic source. On the basis of all these features we infer that they can correlate with the cretacic basanite and trachybasalt near Las Chacras town, also in the same granitic environment of San Luis, and they would represent the influence of the Atlantic ocean opening.

Keywords: alkaline basic rocks, San Luis, Cretaceous.

HIDROBORACITA – CaMgBO 11•6H 2O - DE MINA APALACHEANA, SIJES, SALTA

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ABSTRACT:

HYDROBORACITE CaMgB 6O11•6H 2O OF APALACHEANA MINE, SIJES, SALTA. The hydroboracite deposit of the Sijes hill (Los Andes department, Salta province) contains the largest known reserves of this mineral in the world. Luciano Catalano discovered hydroboracite in the region around 1925. Hydroboracite is interlayered with gypsum, claystones, siltstones and tuffs in the lower section of the Sijes Formation (Monte Amarillo Member). The age of the borate beds is Late Miocene (6.8 to 6.2 Ma). Generally, hydroboracite occur as massive hard beds, yellow to white in color, from 0.10 to 1 m thick. In this paper we introduce a couple of new occurrences of hydroboracite, discovered in the southern sector of Apalacheana mine. At this point, a 0.30 m bed contains two different types of habits. One of them occurs as clear to milky crystals up to 1.5 cm long, often forming rosettes, resembling gypsum crystals. The second one has acicular habit, forming fibrous, fibro radiated and parallels aggregates of silky luster. The optical and physical properties, XRD, FTIR analytical data are given. The strongest diffraction lines for the prismatic crystals are: 5.771(100), 3.319(77), 6.681(58), 1.912(39) and for the acicular crystals are: 6.702(100), 5.794(99), 3.324(77), 2.438(50). Optical refractive indices: a = 1.520(1), b = 1.534(1), g = 1.569(1). Birefringence: 0.049 for wavelength 589 nm. Biaxial positive. Optic axial angle: $2V_{calc} 65^{\circ}51'$. Optical orientation: X ? c 31°, Y = b, Z ? c 59°. Pleochroism: none, X = Y = Z = colourless.

Keywords: Hydroboracite, Borate, Puna, Sijes, Continental evaporites

**CARACTERÍSTICAS GEOQUÍMICAS Y PETROLÓGICAS DE LAS METAMORFITAS DE
BAJO GRADO EN EL DISTRITO WOLFRAMÍFERO DE PASO DEL REY, SAN LUIS.
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ABSTRACT:

**GEOCHEMICAL AND PETROLOGIC CHARACTERISTICS OF THE LOW GRADE
METAMORPHICS AT PASO DEL REY TUNGSTEN DISTRICT, SAN LUIS, ARGENTINA.** The Paso del Rey tungsten district is located at the low grade metamorphic belt in the southern portion of the igneous-metamorphic basement (late Proterozoic - early Paleozoic) Sierra of San Luis, Eastern Pampean Ranges, Argentina. The lithology consisting of phyllites, metapsamites, metapsephites and metavolcanic rocks of the San Luis Formation and low to middle grade quartz-micaceous schists, situated to the west of this formation. Rich-garnet quartzites (coticules), metavolcanic rocks and schists are found in neighbouring scheelite mines. Based on electron microprobe analyses, the composition of zoned garnets corresponds to almandine and spessartine. The chemical data of several metasedimentary protolithic rocks and geochemical analyses would support the genetic relationship between the San Luis Formation and quartz-micaceous schists. Also an attempt to establish the possible manganese and tungsten source in the original sedimentary basin is made.

Keywords: geochemistry, metamorphic rocks, wolfram deposits, San Luis, Argentina

EXPLOTACIÓN Y PERSPECTIVAS DE LA MINA PUEBLO VIEJO (W, Bi, Au, Ag), SUROESTE DE BOLIVIA

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ABSTRACT:

EXPLOTATION AND PERSPECTIVES OF THE PUEBLO VIEJO MINE (W, Bi, Au, Ag), SOUTHWEST BOLIVIA. The Pueblo Viejo mine is a tungsten veins deposit and it is emplaced in the Galán Volcanic Complex (Miocene). The veins have east-west direction, and its mineralogy is complex. The principal ore mineral is wolframite associated with pyrite, bismuthinite, hematite, chalcopyrite, cassiterite, Au and Ag species. Genetically this polymetallic vein type is related with a Miocene subvolcanic stock. The exploitation is in Shrinkage system and there are perspectives for the continuity of the veins in the deepest levels, currently geologic resources.

Keywords: Explotación, Mina Pueblo Viejo, wolframio, suroeste Bolivia

THE MESOZOIC ARC VOLCANISM AT NORTHERN MILLERAND ISLAND. MARGUERITE BAY, ANTARCTIC PENINSULA

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ABSTRACT:

Along the northern shoreline of Millerand Island a widespread volcanic unit -mainly composed of rhyolithic/ rhyodacitic crystalline and lithic tuffs and andesitic lava flows- rests unconformably over heterogeneous plutonic rocks of probably Early Jurassic age. An homogeneous compositionally unit of monzo- and syenogranites intrudes the volcanics. A set of rhyolite dikes predates granite emplacement. A compositionally diverse group of mafic dykes represents the final magmatic activity in this area

Keywords: Millerand Island - Antarctic Peninsula - volcanic rocks - granites

ESTUDIO DE INCLUSIONES FLUIDAS EN LAS VETAS (Cu-Au) DEL BAJO DE LA LEONA, SANTA CRUZ: SUPERPOSICIÓN DE SISTEMAS DE FLUIDOS MINERALIZANTES DE DIFERENTE ORIGEN

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ABSTRACT:

FLUID INCLUSION STUDIES IN Cu-Au VEINS FROM BAJO DE LA LEONA, SANTA CRUZ: SUPERPOSITION OF DIFERENT MINERALIZING FLUID SYSTEMS. Fluid inclusions in quartz from different Bajo de La Leona vein systems which are related to granitic and granodioritic rocks outcropping in the eastern part of Macizo del Deseado, Santa Cruz province, were studied. Barren veinlets hosted by leucogranite are similar to those related to porphyry-type environment. The mineralized (Au) veins in the same unit are generated in epithermal conditions. The Cu-veins in La Leona Mine and Schultz vein, related to granodioritic rocks (La Leona Formation), are generated by another different epithermal system. Therefore, the veins associated to granite and the La Leona and Schulz epithermal system are considered as being formed at different depths.

Keywords: Fluid inclusions - Bajo de La Leona - Santa Cruz

MINERALOGIA Y TEXTURAS SUPERFICIALES DEL DEPOCENTRO EVAPORÍTICO DE SALINAS CHICAS, VILLARINO. PROVINCIA DE BUENOS AIRES.

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ABSTRACT:

MINERALOGY AND SUPERFICIAL TEXTURES OF SALINAS CHICAS EVAPORITIC DEPOCENTER, VILLARINO, BUENOS AIRES PROVINCE. Salinas Chicas is a modern continental evaporitic deposit (salt-pan), located inside a structural basin at - 42 m. It is placed in the southern region of Buenos Aires Province, 60 km far from Bahía Blanca. Clastic facies occur in the sand-flat and mud-flat. The salt-pan is composed mainly by halite, with minor gypsum and glauberite. The NaCl is extracted by "harvest" method, with a production of 200.000 annual tons. In this paper, the superficial textures and fluid inclusions of chevron, comet and hopper halite-shaped- fabric are described.

Keywords: Salinas Chicas - salt-pan deposit - halite textures

GEOLOGIA Y MINERALOGIA DEL YACIMIENTO PEGMATITICO AIDA, DISTRITO CONLARA, SAN LUIS ARGENTINA.

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ABSTRACT:

GEOLOGY AND MINERALOGY OF THE AIDA PEGMATITE, CONLARA DISTRICT, SAN LUIS, ARGENTINA. The Aida mine is located at 32° 14' 08'' S and 65° 39' 28'' W, 16 km to the east of Quines, San Luis, Argentina. This mineral deposit is part of the San Martín-Cautana group, of the Conlara pegmatite district. The pegmatite is hosted by the micaschists of medium metamorphic grade; it has irregular shape, with 400 m length and 200 m width size in the central segment, N-S strike and sub-vertical dip. The deposit displays internal zonation, from the margin inwards is identified: border, wall, intermediate external, intermediate internal and core zones. Some fracture-filling and replacement units have been recognized. On the basis of its mineralization, this deposit is a beryl type pegmatite, and probably a beryl-columbite-phosphate subtype, with LCT geochemical signature, and a significant economic potential in ceramic minerals. The structural state of the alkali feldspars of the Aida mine indicates that they have a full ordered structure, the muscovite samples analyzed belong to 2M1 polytype.

Keywords: pegmatite - mineralogy - internal structure - feldspar ordering - muscovite polytypism

LA ZONA DE ALTERACION DEL CERRO TRES HERMANOS, MENDOZA ARGENTINA

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ABSTRACT:

THE ALTERATION ZONE OF CERRO TRES HERMANOS, MENDOZA, ARGENTINA. The alteration zone of Cerro Tres Hermanos, Bloque de San Rafael, Mendoza, is characterized by areas with intense bleaching in carboniferous quartzites and propylitic alteration in lower Permian subvolcanic rocks. Evidences of potassic alteration related to the acid lower Permian porphyries are also recognized. Close to the alteration out three base metal veins zone crop. Based on this preliminary data a porphyry type mineralization model is suggested.

Keywords: Porphyry deposit; Lower Permian; Cerro Tres Hermanos; Mendoza

MINERAL DE U-Ta-Nb EN LOS GRANITOS SAN IGNACIO-CUMBRE DE LOS PINOS CATAMARCA-TUCUMAN

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ABSTRACT:

U-Ta-Nb MINERAL OF SAN IGNACIO-CUMBRE DE LOS PINOS GRANITE, CATAMARCA-TUCUMAN. This paper reports the second occurrence in Argentina of uranium-tantalum-niobium oxide crystals, which are associated to the quartz-muscovite pegmatite of San Ignacio and Cumbre de los Pinos granites, province of Catamarca and Tucumán. The mineral was studied by petrographic, XRD and SEM-EDAX techniques. It forms small, pale yellow to ochre crystals (≤ 1 mm) or aggregates that occur among the pegmatite columbite-tantalite grains and muscovite flakes. The idealized formula for this species could be: $A_{1-2}B_2O_6(O,OH,F).nH_2O$. The presence of U partially (or completely?) oxidized, U⁴⁺ to U⁶⁺, or (UO₂)⁺⁺, as well as small amounts of Ca, Al, Fe and Ti, is noteworthy. This mineral is found as an alteration product of columbite-tantalite.

Keywords: U-Ta-Nb oxide- pegmatite- granite

COBRE NATIVO Y CUPRITA EN UNA PARAGÉNESIS CEOLÍTICA EN AMÍGDALAS DE LAVAS BASÁLTICAS, CHAPELCO, PROVINCIA DEL NEUQUEN

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ABSTRACT:

NATIVE COPPER AND CUPRITE IN ASSOCIATION WITH ZEOLITES IN AMYGDALAS IN BASALTIC LAVAS, CHAPELCO, NEUQUEN PROVINCE. Amygdules in basaltic lava flows filled with native copper, cuprite, zeolites, fluorapophyllite and other minor silicates were identified at the base of Chapelco Mt., 10 km south of San Martín de los Andes, Neuquen Province. The geological setting is the western belt of the Andean-Patagonian Volcanic Province. The volcanics of the Andean Andesitic Series ageing Paleoceno-Eoceno are represented in the area by mafic lavas mainly composed of sub-alkaline basalts and basaltic andesites. The metamorphism ranges from very low grade to low grade reaching the zeolite to prehnite-pumpellyite facies with some minor greenschist facies. Shear zones of local extension are identified in the area. Conspicuous alteration due to regional hydrothermal metamorphism affected the lavas. The secondary minerals fill amygdules and replace the primary minerals of the original rock. Geochemically, these rocks are sub-alkaline tending to alkaline tholeiitic basalts with a middle potassium content. The abundant secondary silicate minerals associated in amygdules with native copper and cuprite are laumontite, chabazite, fluorapophyllite, smectites, chlorite, pumpellyite and scarce prehnite. The silicate minerals were the first minerals to precipitate followed by native copper, which filled available intergranular spaces mainly in the central part of the cavities. By weathering, the native copper was replaced by cuprite. The association of native copper with basaltic lavas is common and widespread, being the Keweenaw Peninsula deposits the most important from an economic point of view. Comparison is made between these last deposits and Chapelco occurrences.

Keywords: basaltic lavas-amygdules-native copper-cuprite-zeolites-Neuquen province

EL OROPIMENTE DE LA MINA GRAN BRETAÑA, ZONA MINERA DE AZULCOCHA, PERÚ

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ABSTRACT:

THE ORPIMENT FROM GREAT BRITAIN MINE, AZULCOCHA MINING AREA, PERÚ. In the Great Britain mine, Azulcocha mining area, Central Andean region of Perú, orpiment was identified. This mine was intensively mined for Zn and As until the last decade. The mineral occurs in association with sphalerite, marcasite, pyrite, melnikovite and realgar, plus other minor sulfides. This paper includes a thorough description of the orpiment from this locality. It occurs in bright lemon-yellow foliated aggregates of up to 5 cm in size and perfect {010} cleavage surfaces horizontally striated due to crystallographic translation along {001}. Its composition is close to the chemical formula but with an average content of 1.5% in weight of Cu, giving rise to the structural formula $Cu_{0.06}As_{1.8}S_{3.14}$. The anomalous Cu content is attributed to local conditions of mineral formation.

Keywords: orpiment - foliated aggregates - Great Britain mine - Azulcocha mining area - Perú.

**DACHIARDITA CALCICA EN METANDESITAS CRETACICAS DEL CERRO NAHUEL PAN.
CHUBUT. REPUBLICA ARGENTINA**

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ABSTRACT:

DACHIARDITE-CA IN CRETACIC METANDESITES OF CERRO NAHUEL PAN, CHUBUT. REPUBLICA ARGENTINA. Dachiardite-Ca in metandesitic breccias of cretacic age, in Cerro Nahuel Pan, near Esquel, Chubut: (42° 30 y 43°LS), was found. This is the first mention of dachiardite in Argentina. It is found in the matrix with yugawaralite and in veins formed by quartz, cristobalite and dachiardite, which is altered to calcite. The optical data of dachiardite are: $2V_a=40-55^\circ$ and strong dispersion $v>r$. It has [100] acicular or fibrous habit, and two perfect cleavages {100} and {001}. The chemical formula is $\text{Ca}_{1.16} \text{K}_{0.91} \text{Na}_0 (\text{Al}_{2.95} \text{Si}_{20.98} \text{O}_{48})_{13} \text{H}_2\text{O}$. The three strongest space lines of the X-Ray Powder Diffraction pattern are: 3.3259 (100); 3.0207 (55) and 2.0837 (12).

Keywords: dachiardite-Ca- yugawaralite-quarz- cretacic metandesites- Nahuel Pan - Chubut

POLIMORFO ORTORROMBICO DE LA SERIE FLUORAPOFILITA/HIDROXIAPOFILITA ASOCIADO A CHABACITA Y LAUMONTITA EN AMIGDALAS DE BASALTOS. CHAPELCO, NEUQUEN

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ABSTRACT:

ORTHORHOMBIC POLYMORPH OF THE FLUORAPOPHYLLITE/HYDROXYAPOPHYLLITE SERIES IN ASSOCIATION WITH CHABAZITE AND LAUMONTITE IN BASALTIC AMYGDALAS. CHAPELCO, NEUQUEN. An apophyllite mineral was discovered in a paragenesis with chabazite, laumontite, cuprite and native copper in amygdalae of basaltic rocks affected by VLGM in zeolite facies, in Chapelco, Neuquen. This apophyllite is a member of the hydroxyapophyllite-fluorapophyllite series. Its chemical formula is : (K 0.91 Ca 3.60) Si 7.81 O 20 (F, OH), 8 H 2O. It is biaxial with $2V_a = 5^\circ - 10^\circ$ and a weak $v > r$ dispersion. The parameters of the unit cell are $a_0 = 8.9639$; $b_0 = 9.0192$; $c_0 = 15.7713$. In accordance with DRX and its optical character, it is a fluorapophyllite orthorhombic polymorph. The chabazite has $R = 0.71$ and its chemical formula is (Ca 1.12 K 0.10) Al 3.53 Si 8.77 O 24.12 H 2O. The metamorphic assemblage of the rocks is: laumontite, wairakite, Ca-heulandite, epidote, pectolite, pumpellyite, smectite/chlorite and chlorite. It shows a calcic to lightly magnesian fluid composition. The fluorapophyllite, with an alkaline composition, and sericite veins were generated as the fluids became enriched in alkali elements. Native copper, cuprite and Fe₂O₃ occurred after the zeolite formation at temperatures lower than 200°C. The hydrothermal fluids would be linked to the intrusion of Tertiary granitoids in this area. The mineralization corresponds to an epithermal environment with a $fO_2 \sim 50$ with low fS_2 , which is in accordance with the hematite, cuprite and native copper stability field.

Keywords: fluorapophyllite/ hydroxyapophyllite -chabazite-laumontite- native copper-cuprite-basaltic amygdalae-Chapelco -Neuquen

PARAGENESIS DE BARRERITA-OFFRETITA-CLINOZOISITA-ESMECTITA EN AMIGDALAS DE BASALTOS. RIO ARRAYANES, CHUBUT.

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ABSTRACT:

ASSEMBLAGES OF BARRERITE-OFFRETITE-CLINOZOISITE-SMECTITE IN AMYGDALOID BASALTS. RIO ARRAYANES, CHUBUT. The purpose of this contribution is the study of a very low grade mineralogical association restricted to precretacic basalt in northwestern Chubut province. This association is composed by pumpellyite, clinozoisite, smectite, barrerite, offretite and cristobalite. Offretite and barrerite together with smectite are found intergrowing into the amygdales and replacing albite and adularia, which take part of a prior very low grade metamorphism (VLGM) process in prehnite-pumpellyite facies. The zeolites are a consequence of an albite and adularia breakdown nearest 200°C in the zeolite facies. According with the textural characteristics, offretite was formed prior to barrerite; this would indicate that part of the original offretite's K, could have been replaced by increasingly sodic fluids, which also contributed to generate barrerite at lower temperatures. Clinozoisite ($P_s = 7.19/10.14$) is stable at temperatures nearest to 200°C. At such temperatures, low pistacite-epidotes coexist with zeolites. Pumpellyite located in amygdales' walls, would be the aluminous variety typical of VLGM. The smectite is a calcic montmorillonite of the montmorillonite-nontronite series which would confirm lower temperatures than 200°C.

Keywords: barrerite - offretite - clinozoisite - smectite - amygdaloid basalts - Río Arrayanes - Chubut.

**MINERALOGÍA DEL COMPLEJO ALCALINO PUESTO LA PEÑA,
PROVINCIA DE MENDOZA, ARGENTINA**

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ABSTRACT:

MINERALOGY OF PUESTO LA PEÑA ALKALINE COMPLEX, MENDOZA, ARGENTINA. In this paper new mineralogical data of the Puesto la Peña alkaline complex are presented. Analyzed rock-forming minerals include: biotites (annite-rich for borolanite-malignite series and eastonite-rich for piroxenite), titaniferous garnet, pyroxene (diopside-hedembergite serie with aegirine molecule), orthoclase, nepheline, and spinels (ulvöspinel and magnetite). These analyses confirm the original petrological classification of this complex as an undersaturated potassic complex belonging to the malignite-borolanite group.

Keywords: alkaline complex, nepheline, biotite, titaniferous garnet, pyroxene, amphibol