

# Secondary copper minerals from the “San Juan Bautista” concession, “San Valentín” open pit, Cartagena, Murcia, Spain

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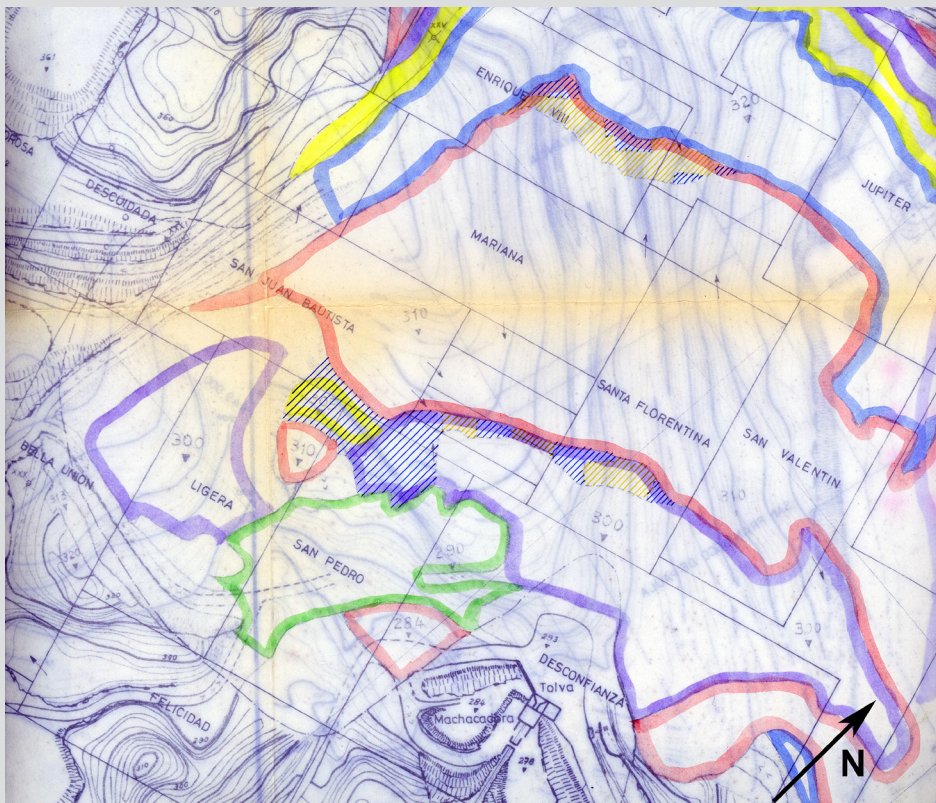
## Introduction

In the Sierra Minera of Cartagena-La Unión, the most abundant metal ores are iron, manganese, lead and zinc, with copper (and tin) minerals that appear only occasionally. The largest work was the “San Valentín” open pit, which is located on several dozens of mining concessions, belonging to different societies, registered in the 1840s and 1850s. One of these companies, the “Sociedad Especial Minera El Fraile”, was founded in 1847, and had its property distributed in only 22 shares (divided into quarters), which were owned by only 6 families linked to trade, the Bosch, Lizana, Russell, Alarcon, Ortiz and Braquehais. This company would be reorganized on successive occasions between that year and 1871, and was the owner of the “San

Juan Bautista” concession registered on October 19, 1847, its extensions and, the adjacent concessions “Descuidada”, registered on 11 November 1847, “Melindrosa”, registered on September 2, 1848 and “Santa Florentina”, on June 12, 1850, in the central area of the Sierra, the richest, in addition to some others subsequently recorded in more distant points. Contrary to what happened in most of Spain, a large number of small mining companies in the Sierra de Cartagena, although they experienced long periods of inactivity, remained alive, and with concessions without expiring, over more than a century. Even some, such as the aforementioned “El Fraile”, distributed considerable dividends over time, so that the possession of their shares, despite the high prices paid at some times for

them, was a good business, with yields of up to 1,000%.

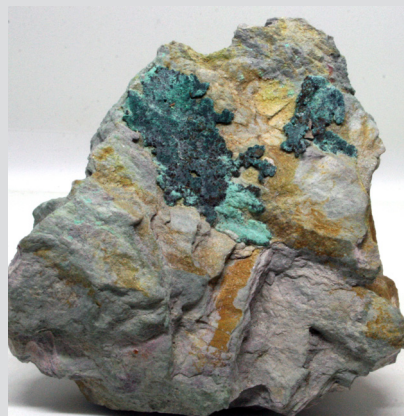
In order to group the concessions and to be able to carry out the exploitation on a large scale and in the open pit, the large mining companies active in the area in the second half of the twentieth century carried out an ambitious company acquisition policy. In the case of the “Sociedad Especial Minera El Fraile”, Francisco Celdrán managed to acquire an important part of the shares in the early 1950s, which were transferred almost immediately, in January 1953, to the “Sociedad Minero



Plan of the concessions located in the “San Juan Bautista” area, in the “San Valentín” open pit. October 1975.

Metalúrgica Zapata Portman S.A.”. This company was owned by 50% of the French multinational “Société Minière et Métallurgique de Peñarroya”, which in 1954 would acquire the other 50%. In 1968, the subsidiary “Sociedad Minero-Metalúrgica de Peñarroya España S.A.” was created, of which the parent company owned 98% of the shares (Maturana et al., 1996). The works in the “San Valentín” open pit began in 1966. In March 1984, these works discovered a section of mining gallery probably from the nineteenth century, located at the level 300 and within the limits of the former concession “San Juan Bautista” (Calvo, 2012). The remaining ore was mainly formed by iron oxides, with small amounts of secondary copper minerals, of a quality unknown so far in the mining district. The specimens immediately drew attention to the optional staff of the mining company, some of whom collected a significant part of the most colorful pieces that appeared. Probably the best specimens were those collected by Miguel Castro Navarro, head of the laboratory of drillcore sampling, although at least one geologist, two relay chiefs and a collector who had news of the discovery also took part in the recovery. Miguel Castro’s collection, made up of a large number of


specimens (weighing about 600 kg), mainly from the open-cast work of the Peñarroya company, was transferred to Santiago Guillén in 1990, and from it, in January 2017, to Mariano Guillén and Manuel Morales. In 2019, most of the pieces were sold in various mineral fairs, including La Unión, mainly by the dealer Miguel David Martínez, being distributed among many collectors.



Superficially altered native copper. “Ligera” mine. Fov 7 cm. M. Calvo coll. and photo.



Superficially altered native copper. “San Juan Bautista” mine. Fov 6.8 cm. M. Morales coll. G. López photo.



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## SOCIEDAD ESPECIAL MINERA

Acción núm. 1. **EL FRAILE.** Cuarto núm. 1.

La Sociedad reconoce a los Sres. Herederos de D. Manuel Lizana como dueños de este cuarto de acción, copiándose el presente título transferible por las formalidades prevenidas en la Ley de Sociedades mineras de 6 de Julio de 1859.

Fundada esta Sociedad en 1847, y formalizada por escritura de 13 Junio 1851, y 6 Abril 1854 ante D. Bernardino Oblaris ceciliano de este número, fue constituida en especial minera mediante escritura por el mismo ceciliano, de 7 Diciembre 1859, 2 Enero 1862, 20 Junio 1863, 25 Junio y 24 Octubre 1864 y 24 Abril 1865; aprobadas respectivamente por el Sr. Gobernador de la Provincia en 17 Abril 1860, 24 Febrero 1862, 5 Diciembre 1863, 9 Julio 1864, 23 Enero y 13 Junio 1865.

Consta de 22 acciones con iguales derechos, siendo en objeto la explotación de las pertenencias mineras que se expresan a continuación situas en los Cuencos de Mas y Miguel término del Gabarral, hoy Villa de la Unión y de cualquiera otra que en lo sucesivo adquiriera.

NOMBRES DE LAS PERTENENCIAS.	FECHAS DE LA DEMARCACION Y POSESION.	FECHA DE LA REAL APROBACION.	FECHA DEL REAL TITULO DE PROPIEDAD.
Mina S. Juan Bautista.	19 Octubre 1847.	14 Febrero 1840.	
Ampliacion á id. (N).	15 Julio 1848.	20 Agosto 1850.	
Demasia á id. (E).			9 Diciembre 1854.
Demasia á id. (E).			4 Mayo 1863.
Mina Descuidada.	11 Noviembre 1847.	30 Abril 1854.	
Demasia á id.			9 Diciembre 1854.
Mina La Primera.	2 Marzo 1848.	17 Setiembre 1850.	
Demasia á id.			24 Febrero 1865.
Mina Melindrosa.	2 Setiembre 1848.	28 Noviembre 1850.	
Mina Santa Florentina.	12 Junio 1850.	19 Abril 1853.	
Demasia á id. (N).			18 Enero 1855.
Demasia á id. (O).			4 Mayo 1863.
Mina Diana.			10 Agosto 1857.
Demasia á id.			3 Diciembre 1854.
Mina S. Nicolás.			6 Abril 1864.
Mina Popipiro.			6 Setiembre 1864.

Cataluña 1.ª de Enero de 1871.

El Presidente, *Miguel Calvo*      El Tesorero, *Miguel Calvo*      El Contador-Scriba, *José P. López*

En fin de cada año se presentará este Título al Tesorero para anotar los dividendos que durante él se hayan hecho.

IMP. DE MONTYLLAS.

Share of the “El Fraile” mining company, operator of the “San Juan Bautista” concession. Col. M. Calvo.



**Malachite** pseudomorph after **cuprite** crystals, associated with **azurite** crystals. “San Juan Bautista” concession, Cartagena, Murcia. Fov 25 mm. M. Calvo coll. J. Callén photo.



Partially altered **cuprite** crystals coated by a mixture of oxides. Fov 17 mm. M. Calvo coll. J. Callén photo.



Rounded crystals of **smithsonite**. “San Juan Bautista” concession. Fov 5 mm. M. Morales coll. L. Arrufat photo.

The site had a very short life, since approximately one and a half months after its discovery, there was a large breakdown of sterile rock (about three million tons) in that part of the open pit and the company, given the low mineralization in lead and zinc and also the relatively low existing tonnage (about 300,000 tons), decided not to continue exploitation in that area, which was covered by debris from other labors. In 1990, the “Roberto” washing plant would be closed, and shortly thereafter, mining in the Sierra de Cartagena would be paralyzed.

### Mineralogy

The copper mineralization was formed exclusively by secondary minerals, deposited in cavities of a mass of ferruginous jasper and iron oxides, which retains in some points small pyrite relict that did not complete its alteration.

**Azurite** crystals with **malachite** pseudomorph after **cuprite** octahedrons “San Juan Bautista” concession. Fov 25 mm. M. Calvo coll. J. Callén photo.



**Azurite** crystals slightly altered in **malachite** in some areas. The main crystal, 18 mm long and well finished at one end, is one of the largest found in this site. “San Juan Bautista” concession. M. Morales coll. G. López photo.



**Azurite** crystals and radiated spherules of **malachite**. “San Juan Bautista” concession. Fov 34 mm. M. Morales coll. G. López photo.

### **Native copper**

The presence of native copper in the Sierra de Cartagena was already indicated by Guardiola (1927), who cites the presence of this mineral in the “Belleza”, “Paulina” and “Agradecida” mines, accompanied by cuprite, as a product of alteration of chalcopyrite. These three concessions are very close to each other, and they are also in the area of the current “San Valentín” open pit, and a short distance to the N and NNW of the “San Juan Bautista” concession. In modern times, in the

1980s, native copper was found, superficially altered to malachite as very flattened dendritic or arborescent formations, of deformed crystals, in very narrow fissures in the rock (Calvo, 1996). These specimens came from the “Ligera” mine, located to the S of the “San Juan Bautista” mine, and adjacent to it. In the “San Juan Bautista” concession, native copper was not very abundant, and was found as arborescent formations of centimetric size, without defined crystals, standing out over iron oxides.



**Malachite, azurite and auriscalcite.** “San Juan Bautista” concession. Fov 5,5 cm. M. Calvo coll. J. Callén photo.



**Auriscalcite with calcite.** “Felicidad” concession. Fov 25 mm. M. Calvo coll. J. Callén photo.



**Malachite pseudomorph** after a **cuprite** crystal on iron oxides. The 2.5 mm cuprite crystal has completely disappeared. “San Juan Bautista” concession. M. Calvo coll. J. Callén photo.

### Cuprite

Cuprite was found in the “San Juan Bautista” mine as octahedral crystals, with modifications of hardly distinguishable dodecahedron faces, up to a centimeter in size, partially altered and covered with a malachite microcrystals coating. These crystals appeared independent of other species or were associated with azurite crystals that had not been altered in any way, in some cases even directly on them. Some specimens were also found with cuprite crystals coated by a dark brown surface alteration formed by a mixture of different oxides, which has not been analyzed in detail. Unaltered crystals are very rare, and have only been found very occasionally and smaller than one millimeter in size.

### Smithsonite

Smithsonite is very abundant in the Sierra de Cartagena, and also in many of the concessions that are part of the open pit “San Valentín”, but it is not in the specific area

where the copper minerals appeared. It has occasionally been found as white, yellowish or greenish crystals, sometimes with internal growth ghosts, rounded and with irregular faces.

### Azurite

Azurite appeared with some abundance in the ancient work of the “San Juan Bautista” concession, as crystals that occasionally could reach sizes of up to 2 centimeters, although they were generally quite smaller. Some of the azurite crystals found in the “San Juan Bautista” mine can be considered among the largest and best found for this species in Spain. The morphology of these crystals is quite varied, appearing either with prismatic development, with stretch marks due to the oscillating growth of several prisms, or as sub-parallel clusters of crystals formed by the combination of prism and pinacoids. In many specimens, the azurite does not show signs of alteration, although it is directly associated with cuprite crystals partially or totally transformed into malachite, but in other cases it is covered by a compact patina and of low thickness of malachite.

### Malachite

Malachite was a very frequent mineral in the work of the “San Juan Bautista” concession and it was discovered in 1984. It was found as thick crust coatings with the outside surface with a felted appearance, as compact spherules with radiated internal structure and as divergent aggregates of acicular crystals. The pseudomorphic malachite of cuprite crystals could appear as partial pseudomorphosis, that is, covering unaltered cuprite relics, in which the malachite forms a compact coating over the cuprite relic, as well as



Microcrystals of **linarite** with cerussite. "San Juan Bautista" concession. Fov 3 mm. M. Morales coll. L. Arrufat photo.

**Malachite.** Aggregate of acicular crystals. "San Juan Bautista" concession. Fov 15 mm. M. Calvo coll. J. Callén photo.



Divergent aggregate of **azurite** crystals, with malachite and auricalcite. "San Juan Bautista" concession. Fov 17 mm. M. Calvo coll. J. Callén photo.

total pseudomorphoses, in which the pseudo-crystal is less defined, formed by associated acicular crystals, individually differentiated and with gaps between them. As already indicated, when the malachite appears altering azurite crystals the alteration is superficial, in the form of a compact crust, even with some brightness.

#### **Auricalcite**

In the concession "Felicidad", located at the SE of "San Juan Bautista" and that was only partially exploited within the "San Valentín" open pit, auricalcite was found precisely in the area that has not been exploited. It appears as aggregates of divergent acicular crystals, greenish blue, associated with transparent crystals of acute rhombohedron-shaped calcite, quite attractive. Auricalcite specimens of "San Juan Bautista" are less colorful, appearing as pale blue coatings, more or less compact formed by microcrystals and located on the scabs of malachite.

#### **Linarite**

Linarite is very rare in the "San Juan Bautista" concession. It has been found very occasionally in cavities of iron oxides, associated with microcrystals or small masses of cerussite. It forms flattened prismatic crystals, tiny but sometimes very well defined, bright and transparent.

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