SMITHSONITE AND OTHER SECONDARY ZINC MINERALS OF THE SAN ANTONIO MINE, SANTA EULALIA DISTRICT, CHIHUAHUA, MEXICO: GIVING THE KELLY MINE A RUN FOR ITS MONEY

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The San Antonio Mine in the East Camp of the famous Santa Eulalia District in Chihuahua has produced aurichalcite, green and bone-white smithsonite pseudomorphs after calcite and yellow and blue smithsonite that rival (surpass?) New Mexico's Kelly Mine. It has also yielded superb white and blue hemimorphite and other secondary zinc species. It is no accident these two distant mines have produced such similar specimens; both are Pb-Zn-Ag-Cu-Fe rich Carbonate Replacement Deposits (CRD) whose upper oxidized zones were diligently exploited for their silver-rich cerussite/anglesite bodies and both have associated irregular supergene zinc mineralization that was ignored until recently by almost everyone except specimen collectors. Modern solvent-extraction metallurgy has been developed that allows recovery of zinc from these long by-passed ores and with luck and changing economics both mines could see revived industrial interest with collateral specimen recovery.

Santa Eulalia is the world's largest known CRD district, with the bulk of production coming from the Buena Tierra and Potosi Mines in the “West Camp” and the San Antonio Mine in the “East Camp.” Oxidation extends to several hundred meters depth in both camps so large volumes of primary sulfide ore were leached of their zinc, which was redeposited as supergene smithsonite, hemimorphite and Fe-Mn-Zn oxides (Megaw 2007). From a smithsonite perspective we care most about the San Antonio Mine, where the upper level sulfide ores were almost completely leached of zinc, which was redeposited as a very well defined, flat-bottomed smithsonite-dominated supergene (“genesis from above”) zinc blanket at the modern water table at the 8th Level of the mine (1,100—1,250 m elevation). The planar nature of the base of this supergene blanket suggests that the water table has been at roughly the same elevation for a long time and that supergene zinc precipitation was triggered by mixing with ground water (Hewitt, 1943; Megaw, 1990). The water table is marked by laterally extensive caverns tens of meters high, wide and long dissolved by the descending acidic oxidizing fluids. The caves are decorated with stalactitic ropy gray, greenish-gray and green smithsonite and locally studded with smithsonite pseudomorphs after scalenohedral and flattened rhombohedral calcite crystals to 10 cm. Most of the pseudomorphs are stained brown by iron-oxide inclusions, but some are bright yellow-orange or yellow-green. These pseudomorphs are thick hollow shells with interior ribbed smithsonite boxworks that appear to follow rhombohedral cleavage patterns, indicating replacement in addition to epimorphic coating. In the upper part of the supergene zone the pseudomorphs occur on gossanous matrix, but they show a transition to depth where they occur on otherwise fresh arsenopyrite or sphalerite. Pristine sulfides with identical unreplaced scalenohedral calcite are known to continue to the bottom of the mine.

Little production work normally takes place in the smithsonite zone because the mixed oxide-sulfide ores found there are difficult to beneficiate. However, at depth in the preferred sulfide ore zone, the miners periodically encounter water-filled fractures that can gush up to 90,000 gallons/minute and rapidly flood the lower levels of the mine. When this happens, attention mining focus shifts to the mixed oxide/sulfide ores at the water table until the deeper levels are pumped out and production can resume. Almost every time this happens smithsonite specimens appear in profusion and this on and off pattern means many San Antonio Mine smithsonites can be dated fairly accurately. After a major flood in 1953 the mine stayed dry until 1982 and quantities of undistinguished white, gray to gray-green and rusty stalactitic smithsonite masses were intermittently produced without great commercial success. After a major flood happened in 1982 a substantial number of bright yellow, orange and lime-green smithsonite specimens (colored by greenockite inclusions) with botryoids to 8 cm and crude crystals to 2 cm were found. After sulfide production was restored smithsonite production dwindled to a trickle until early 1998, when an access drift for an expanded underground repair shop was carved out of the smithsonite zone. First, small numbers of rice-grain size and shaped bright-blue smithsonite perched on transparent colorless hemimorphite appeared. Although very pretty, they were too small to be of more than locality interest; but they did fire the imagination for more. Clandestine specimen collectors tried to work the zone, but the ground is hard and proximity to the shop meant company vigilance was high. Things changed quickly in the spring of 1999, when the mine again flooded and production shifted upwards. A small number of superb miniature to cabinet sized, brilliant green translucent smithsonite knobs and stalactites to 15 cm long
studded with hemimorphite appeared. Although this flood was quickly controlled and mining returned to the deeper levels, the prices realized for the stalactites caught collectors’ attention, so with the collusion of mine staff members, specimen collecting in the zone continued. Only gray-green to yellow-green balls and heart-shaped distorted twinned (?) rhombs were found until late November 1999 when phenomenal electric blue botryoidal and stalactitic masses from thumbnail to boulder-size were hit (Megaw 2007). Many had associated hemimorphite, some had sharp doubly-terminated anglesites to 1 cm, and a few had 7 mm cerussite crystals perched on them! Others showed patches of white hydrozincite, and a few 1 cm aurichalcite balls with hemimorphite were also found. This pocket only produced 25 very good pieces, with 6 truly excellent ones. However, hundreds of good pieces of botryoidal bluish, green and yellow smithsonite and numerous pieces with isolated 3-8mm blue rice-grain-shaped crystals perched on colorless 5-10mm hemimorphite blades were mined. Some of these have associated tiny sharp orange barite crystals. A few blue heart-shaped distorted rhombs (twins?) also appeared, including excellent thumbnails and small miniatures. During renewed flooding in 2012-13 a few superb lustrous lime green pseudomorphs after calcite scalenohedra up to 7 cm long were produced with large numbers of inferior examples. This find also included some very good replacements of platy and rhombohedral calcite.

The mine is currently (late 2015) struggling with flooding again, so we should expect to see new variations on the San Antonio smithsonite theme again soon.

References:


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