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designed to allow maps with different types of information to be readily produced.

[1] Derry Michener Booth & Wahl, Toronto
[2] Robinson Exploration Services Ltd., Toronto

GEOLOGY, MINERALOGY AND GEOCHEMISTRY OF THE WINDY-CRAGGY DEPOSIT, NORTHWESTERN BRITISH COLUMBIA

J.M. Peter[1], S.D. Scott[1]

The Windy Craggy massive sulphide deposit is within the allochthonous Alexander terrane of the Insular tectonic belt in extreme northwestern British Columbia. Host rocks are a volcano-sedimentary succession of mixed graphitic argillites and mafic pillowed and massive volcanic flows of Upper Triassic age that have been intruded by mafic volcanic dikes and sills. The deposit consists of two or more sulphide bodies that have been folded, faulted, and possibly sheared in places. Reserves currently (end of September, 1989) are 120 million tons grading 1.9% copper with values in gold, silver, cobalt, and zinc. This reserve figure is a minimum, as a large part of the deposit has not been systematically drilled. Mineralization consists predominantly of massive pyrrhotite and/or pyrite with lesser chalcopyrite and magnetite. Minor and trace minerals include sphalerite, arsenopyrite, galena, valleriite, marcasite, cubanite, cobaltite, gold, electrum, and native silver. Gangue minerals are quartz, chlorite, calcite, ankerite, siderite, stilpnomelane, biotite, graphite, hematite, hisingerite, and cordierite. Mineralization comprises massive sulphide, stringer/stockwork, and finely bedded to laminated sulphides and exhalites. Mineralization occurs within both the volcanic and sedimentary rocks and therefore displays similarities with the "Besshi-type" class of massive sulphide deposits.

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SEAFLOOR HYDROTHERMAL MINERALIZATION IN THE GUAYMAS BASIN, GULF OF CALIFORNIA

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Hydrothermal mounds, chimneys, and spires occur at 2000 m water depth in the Southern Trough of Guaymas Basin, central Gulf of California. Many of these structures are actively venting hydrothermal fluid in excess of 300°C. The hydrothermal mineral precipitates are composed predominantly of carbonates (calcite, aragonite), sulfates (anhydrite, barite), silicates (amorphous silica, stevensite), metal sulfides (pyrrhotite, marcasite, pyrite, sphalerite, wurtzite, galena, isocubanite, and chalcopyrite) and iron oxides. Fluid inclusion microthermometric measurements made on primary inclusions in calcite from individual chimneys give mean trapping temperatures from 213 to 277°C and salinities of 4.1 to 5.8 equivalent weight percent NaCl. Trapping temperatures are in good agreement with temperatures of venting hydrothermal fluid measured with Alvin's thermocouple probe. Fluid inclusion salinities, however, cannot be reconciled with salinities measured from the presently venting fluids. This suggests that fluid inclusion studies can be used to delineate temporal and spatial variations in vent fluid chemistries. Mineral assemblages, compositions of individual minerals, and fluid inclusion measurements can be explained best by mixing of hot end-member hydrothermal fluid with cold ambient seawater. Most minerals are precipitated at the vent site largely in response to decreasing temperature induced by mixing with seawater.

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LIQUID HYDROCARBON-BEARING INCLUSIONS IN MODERN HYDROTHERMAL CHIMNEYS AND MOUNDS FROM THE SOUTHERN TROUGH OF GUAYMAS BASIN, GULF OF CALIFORNIA

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Liquid hydrocarbon-bearing inclusions of variable shape (e.g., spherical, bowling pin, rod, and highly irregular) occur in hydrothermal minerals of chimneys and mounds in the southern trough of Guaymas Basin, central Gulf of California. The inclusions are preferentially trapped in amorphous silica which occurs as spherules and 0.01 mm encrustations on sulfides, sulfates, and carbonates. The inclusions are primary and were trapped during, not after, mineral growth. The inclusions are both two-phase (liquid hydrocarbon and vapour/gas) and three phase (liquid hydrocarbon, aqueous fluid and vapour), and range from 2 to 50 microns in diameter. The large range in hydrocarbon and aqueous fluid contents indicates that the hydrothermal fluid and hydrocarbons were never a homogeneous solution but hydrocarbons were transported as immiscible and, possibly, solvated forms. The hydrocarbons vary in colour from deep to pale orange-brown and fluoresce yellow during excitation by ultraviolet light, indicating a condensate composition. Measurable quantities of hydrocarbons within inclusions could not be isolated by solvent extraction upon mineral dissolution, which suggests that the more volatile components predominate. Two-phase hydrocarbon inclusions homogenized at temperatures ranging from 75 to 190°C; an unknown correction must be applied to obtain true trapping temperatures. However, the true trapping temperatures of these inclusions was determined by measuring trapping temperatures for adjacent aqueous inclusions, which range from 116 to 226°C. Geochemical modelling using these temperatures indicates that the amorphous silica was deposited from the hydrothermal fluid by conductive cooling and mixing with ambient seawater. The temperatures required for the formation of modern petroleum in the Guaymas Basin appear to coincide with those required for the abundant precipitation of amorphous silica in the Guaymas Basin hydrothermal system.

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THE FRANCOEUR GOLD MINE, ROUYN-NORANDA DISTRICT, QUEBEC

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The Francoeur mine, located in the township of Beauchastel, is presently the only gold producer in the western portion of the Rouyn-Noranda district. Originally discovered in 1923 and officially re-opened in 1988, it is shared equally by Les Ressources Minières Rouyn Inc. and Minerais Lac Ltée.

The deposit is situated in the Blake River Group along a regional E-W inverse shear zone known as the Francoeur-Wasa shear (FWS). This hundred-metre-wide shear dips 35° to 55° to the north. The mine lithologies are oriented E-W, and include mafic to intermediate volcanics, a large diorite intrusion, and red aphanitic dykes. These dykes are syn-tectonic and occur dominantly in the most intensely sheared units. The regional schistosity, also oriented in an E-W direction, dips steeply to subvertically to the north.

The presently-exploited gold mineralization consists of disseminated pyrite localized in three distinct shear zones within the FWS envelope. The host rocks are intensely hematized and carbonatized. Carbonatized rock and most of the gold appear to be restricted to thin mylonite zones that formed at the expense of the