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COPPER DEPOSITION IN INGALDHAL-CHITRADURGA – KARNATAKA COPPER MINES

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ABSTRACT

The nature of mining process creates a potential unenthusiastic impact on the environment both during the mining operation and for years after the mine is closed. This impact has led to most of the world's nations adopt system to moderate the negative effects of mining operation. Safety has long been a concern as well, though modern practices have superior safety in mines considerably. Copper [Cu] is a widely distributed and abundant element in combination and is also found in the native state. Copper is a comparatively soft but extremely tough metal, very ductile and malleable when pure and next to silver the best conductor of electricity. Copper is obtained from its ore usually sulphide by an elaborate series of metallurgical operations, commonly consisting of roasting, to expel part of the combined sulphur, fusion in blast for the production of a concentrated double sulphide copper and iron called "matte". In Ingaldhal (14'11' : 76'27') area of Chitradurga schiest belt, ancient working of Cu were noticed by "R.Bruce Foote" in 1886 on Belliguda hill.Not all metal deposits have igneous origins- sedimentary deposits can also be a valuable source of many metals, including copper. While sedimentary copper deposits share the feature of a sedimentary origin, there are many different types of sedimentary copper deposits, each with distinct characteristics. Sedimentary deposits are generally stratiform- meaning their morphology is controlled by stratigraphy of their host rocks. Sedimentary deposits are generally tabular, sheet-like or flat lenticular form. They are horizontal if not disturbed, but are frequently folded and faulted. Beds containing metallic ore are generally less than 20 ft. thick.

Key Words : 1.Metallic Ore 2. Cu-Copper 3.Genetic Type 4. Deposit 5.Copper Sulphide 6.Rocks 7. mining

Sub Area : Mining Engineering
Broad Area: Engineering Geology

INTRODUCTION

Green stone belt, the area comprise of unconsolidated and chemical sediments constituting the upper statigraphic sequence of Jogamandi volcanic pipe. The area form a part of easterly steeply deeping limb of the Southern plunging anticline structure which is known as Chitradurga Anticline . Precipitation is generally due to a of chemical change, either through the contact of certain host rocks, or as in the case with sedimentary exhalative deposits, through contact with water. Sedimentary copper may be deposited in the pore spaces of permeable rocks, or in faults and fractures.

DEVELOPMENT OF COPPER ZONE

A common cause of precipitation is when copper-bearing fluids across a reduction front, resulting in the precipitation of copper sulfides. While sedimentary rock-hosted stratiform deposits are relatively common- large sized deposits are not. Currently, supergiant deposits are recognized in only three basins: the Paleoproterozoic Kodaro-Udokan basin of Siberia, the Neoproterozoic Katangan basin of south-central Africa, and the Permian Zechstein basin of northern Europe. **Copper bearing sandstones and shales** Copper can be deposited in sandstones and shales from the precipitation of metals from fluids circulating in the host rock. Geologists' have differing opinions as to whether this generally happens at the time the host rocks were deposited or later on, but both schools of thought agree that the minerals were deposited when the fluids reached a "chemical trap", a place where the chemistry of the rock changed in a way that made it impossible for the metals to remain in solution. **Red-bed deposits** Red-bed deposits are named, obviously so, due to their red coloration, which is the result of oxidation of the rocks after exposure to the atmosphere. There are two distinct types of red-bed deposits, volcanic and sedimentary. The volcanic variety is of more economic importance than the sedimentary; however, in this article we will keep our focus on the sedimentary variety. Sedimentary red-bed deposits are relatively small, and as a result are rarely mined. Currently, two known producers are the Dzhezkazgan deposits of central Kazakstan and the Paoli deposit of Oklahoma.**Kupferschiefer-type deposits** These large, regionally extensive deposits are similar to the red-bed type. Kupferschiefer-type deposits form in a transitory marine-terrestrial environment, most likely created by the gradual submergence of land by a shallow sea. Kupferschiefer deposits are a result of red-beds, formed in a terrestrial setting, being overlain by reduced marine sedimentary rocks.**Sedimentary Exhalative Deposits**SedEx deposits are formed when hydrothermal fluids enter a water reservoir, such as an ocean, and precipitate minerals. SedEx deposits are the world's most important lead and zinc source, and a secondary source of copper.**Sedimentary copper miners and explorers** A maiden exploration program is currently underway on the property. The tenement includes numerous prospective copper targets identified from previous stream sampling results and prospective geology. Exploration will be aimed at large scale sedimentary hosted copper deposits similar to Mount Isa and Gunpowder in Queensland and the large copper deposits of Zambia and the Democratic Republic of Congo.Caribou Copper Resources Ltd. The central curvilinear green stone belt of Karnataka running from Gadag in North to Srirangpattanam in the south is best developed in its middle part around Chitradurga, which as also known as "Chitradurga-schist belt". Sedimentary deposits are generally stratiform- meaning their morphology is controlled by stratigraphy of their host rocks. Sedimentary deposits are generally tabular, sheet-like or flat lenticular form. They are horizontal if not disturbed, but are frequently folded and faulted.

Underground mining (hard rock)

Underground hard rock mining refers to various underground mining techniques used to excavate hard minerals such as those containing metals like gold, copper, zinc, nickel and lead or gems such as diamonds. In contrast soft rock mining refers to excavation of softer minerals such as coal, or oil sands.

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Mine Access

Underground Access

Accessing underground ore can be achieved via a decline (ramp), vertical shaft or adit. Declines can be a spiral tunnel which circles either the flank of the deposit or circles around the deposit. The decline begins with a box cut, which is the portal to the surface. Depending on the amount of overburden and quality of bedrock, a galvanized steel culvert may be required for safety purposes.

Shafts are vertical excavations sunk adjacent to an ore body. Shafts are sunk for ore bodies where haulage to surface via truck is not economical. Shaft haulage is more economical than truck haulage at depth, and a mine may have both a decline and a ramp. Adits are horizontal excavations into the side of a hill or mountain. They are used for horizontal or near-horizontal ore bodies where there is no need for a ramp or shaft. Declines are often started from the side of the high wall of an open cut mine when the ore body is of a payable grade sufficient to support an underground mining operation but the strip ratio has become too great to support open cast extraction methods.

Ore Access

Levels are excavated horizontally off the decline or shaft to access the ore body. Stopes are then excavated perpendicular (or near perpendicular) to the level into the ore.

Ventilation

Door for directing ventilation in an old lead mine. The ore hopper at the front is not part of the ventilation.One of the most important aspects of underground hard rock mining is ventilation. Ventilation is required to clear toxic fumes from blasting and removing exhaust fumes from diesel equipment. In deep hot mines ventilation is also required for cooling the workplace for miners. Ventilation raises are excavated to provide ventilation for the workplaces, and can be modified to be used as escape routes in case of emergency.The main sources of heat in underground hard rock mines are virgin rock temperature, machinery, auto compression, and fissure water although other small factors contribute like people breathing, inefficiency of machinery, and blasting operations.

Mining Methods

The process of mining the earth and finding the metals, minerals, etc and again making the earth to return back to its original state consists of different steps. Generally, mining techniques can be broadly classified into two types, they are Surface Mining and Underground Mining.

Cut and Fill mining is a method of short hole mining used in narrow ore zones. An access ramp is driven off the main level to the bottom of the ore zone to be accessed. Using development mining techniques a drift is driven through the ore to the defined limit of mining. Upon completion the drift (or "cut") is filled back to the access ramp with the defined type of backfill, which may be either consolidated or unconsolidated. Another drift is driven on top of filled cut. This process continues until the top of the stope is reached.

Drift and Fill is similar to cut and fill, except it is used in ore zones which are wider than the method of drifting will allow to be mined. In this case the first drift is developed in the ore, is backfilled using consolidated fill. The second drift is driven adjacent to the first drift. This carries on until the ore zone is mined out to its full width, at which time the second cut is started atop of the first cut.

Room and Pillar mining : Room and pillar mining is commonly done in flat or gently dipping

bedded ore bodies. Pillars are left in place in a regular pattern while the rooms are mined out. In many room and pillar mines, the pillars are taken out starting at the farthest point from the stope access, allowing the roof to collapse and fill in the stope. This allows a greater recovery as less ore is left behind in pillars.

Block Caving such as is used at the Northparkes Mine in NSW, Australia, is used to effect with large sized orebodies which are typically composed of low-grade, friable ore. The method works best with cylindrical, vertical orebodies. Pre-production mining development work consists of driving accesses underneath the orebody. This includes the formation of "drawbells" by undercutting and blasting. Initially, blasted ore is removed via the extraction level underneath the drawbells until a sufficient area of unsupported ore is formed that the orebody begins to fracture and cave on its own. The eventual aim of the block caving method is that the friable ore needs no blasting and continues to fracture and break up on its own, flowing down the drawbells to the extraction level, where it is removed from the ore chute mouths with loaders and sent off for processing. Eventually the fracturing will propagate to the surface, resulting in subsidence. One of the main hazards associated with block-caving is that fracturing can potentially stop before it reaches the surface unbeknownst to the people in control of the mine. If fracturing stops propagating upwards and extraction continues, a large void can be formed, resulting in the potential for a sudden and massive collapse and catastrophic windblast throughout the mine.

Mine ore is drawn mainly from the adjacent Mallapa Shaft ore-bin of 1000 tonnes capacity, while ore from the other shafts is brought in to the crushing circuit via a surface ore-bin of about 200 tonnes capacity equipped with chain feeder and inclined conveyor belt etc. ROM is crushed to -10 mm size in three stages. In the first stage there are three nos. of Kue Ken Jaw crushers, which act as primary crusher and crushed ore stored in 200 MT. In the second stage 2 Nos. of 3' standard symon cone crusher act as secondary crusher and in the tertiary stage, there are 2 nos. of 3' short head and 2 nos. of 4' short head symon cone crushers. These crushers are in close circuit with vibrating screen. Crushed product is stored in a fine ore bin of 1500 tons capacity before feeding to grinding plant. Automatic sampler and weight meter and weighbridge provide the necessary production input details.

ELUTION & ELECTRO-WINNING PLANT

The clean & gold loaded carbon is elution columns by maintaining the specific parameters. The gold in the pregnant solution is recovered in electrolytic cells using steel wool as a cathode on which the gold is deposited. The stripped carbon that retails a very little gold is activated and reused.

CONCLUSION

This paper reveals that Green stone belt, the area comprise of unconsolidated and chemical sediments constituting the upper statigraphic sequence of Jogamandi volcanic pipe. The area form a part of easterly steeply deeping limb of the Southern plunging anticline structure which is known as Chitradurga Anticline . Precipitation is generally due to a of chemical change, either through the contact of certain host rocks, or as in the case with sedimentary exhalative deposits, through contact with water. Sedimentary copper may be deposited in the pore spaces of permeable rocks, or in faults and fractures.

This paper focuses on method of mining that, Mining is the removal of valuable raw materials or other geological materials from the earth, from an ore body, vein or (coal) seam. The term also includes the removal of soil. Materials healthier by mining include base metals, precious metals, iron, uranium, coal, diamonds, limestone, oil shale, rock salt and potash. Any fabric that cannot be grown through agricultural processes, or created unnaturally in a laboratory or factory, is usually mined. Mining in a wider sense include taking away of any non-renewable resource.Mining of stone and metal has been done since pre-historic times. Modern mining processes involve prospect for ore bodies, analysis of the profit possible of a proposed mine, removal of the desired resources and finally retrieval of the land to get ready it for other uses once the mine is closed.

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