SARI

Deep Mill Level Zone (DMLZ) merupakan tambang bawah tanah yang berada di bagian terbawah dari cebakan bijih East Erstberg Skarn System (EESS) berada pada sisi tenggara tambang terbuka Grasberg pada elevasi ketinggian 2500 – 3100 meter yang ditambang dengan sistem *block cave*. Untuk mengembangkan tambang bawah tanah ini secara berkelanjutan diperlukan penelitian rasio unsur logam membantu mengidentifikasi zonasi mineralisasi dan memperkirakan kualitas bijih lebih akurat. Penelitian ini bertujuan mengetahui korelasi antar unsur logam dan hubungan rasio unsur logam terhadap litologi, alterasi dan mineralisasi. Metode penelitian yang dilakukan yaitu metode observasi lapangan dengan *core detail logging* pada *core* hasil pengeboran di area tambang bawah tanah, metode pengambilan sampel batuan dengan cara *core drilling sampling*, dan metode analisis laboratorium berupa petrografi dan mineragrafi. Stratigrafi daerah penelitian terdiri dari tiga satuan batuan berurutan dari tua ke muda yaitu satuan skarn-dolomit Waripi (Paleosen), marmer-dolomit Waripi (Paleosen - Pliosen) dan diorit Ertsberg (Pliosen). Zona alterasi yang berkembang terbagi menjadi enam zona yaitu zona alterasi k-feldspar + kuarsa + biotit sekunder + magnetit ± serisit ± anhidrit (potasik), zona alterasi klorit + kuarsa ± epidot ± serisit ± anhidrit ± magnetit (propilitik), zona alterasi garnet + epidot-klorit + anhidrit + magnetit + kuarsa (endoskarn), magnetit + serpentin + epidot + anhidrit ± garnet ± tremolit (magnetit eksoskarn), zona alterasi tremolit + serpentin + epidot + anhidrit + phlogopit ± magnetit (tremolit – serpentin eksoskarn) dan zona alterasi tremolit + talek + anhidrit (tremolit – talek eksoskarn). Zona mineralisasi terbagi menjadi empat zona, yaitu zona mineralisasi pirit + kalkopirit, zona mineralisasi pirit + kalkopirit ± molibdenit, zona bornit + kalkopirit + pirit ± kovelit dan zona mineralisasi pirit + kalkopirit ± sfalerit ± galena. Korelasi kadar unsur logam terbagi menjadi dua, yaitu korelasi positif dengan unsur Cu vs Au, Cu vs Ag, Pb vs Zn, Au vs Ag, Ag vs Zn, Ag vs Pb, Cu vs Zn, Cu vs Pb, Cu vs Mo, Au vs Zn, Au vs Pb, Ag vs Mo, Zn vs Mo dan korelasi negatif dengan unsur Au vs Mo, Pb vs Mo. Hubungan rasio unsur logam terbagi menjadi empat rasio, yaitu Au/Cu menghasilkan nilai rasio yang semakin tinggi seiring berkurangnya kedalaman dan menuju distal skarn (tremolit – talek eksoskarn) secara litologi marmer-dolomit dari pusat porfiri (potasik) secara litologi diorite, Ag/Au menghasilkan nilai yang cenderung konstan dan rendah pada litologi diorit dan skarn-dolomit, alterasi potasik, endoskarn, magnetit dan tremolit-serpentin eksoskarn dan meningkat sedikit diakhir drillhole pada litologi marmer-dolomit dan alterasi tremolit-talek eksoskarn menunjukkan nilai Au lebih besar daripada Ag yang berarti pengkayaan emas lebih dominan daripada perak yang minor. Cu/Mo menghasilkan nilai yang menurun seiring bertambahnya kedalaman pada litologi diorit dengan alterasi endoskarn, potasik, dan propilitik akibat pengaruh tekanan dan fluida hidrotermal. Rasio (Ag×Au)/(Cu×Mo) menurun di kedalaman dan meningkat di bagian dangkal, mengindikasikan zona sub-ore pada intrusi diorit dan zona supra-ore atau pinggiran sistem porfiri/skarn di litologi marmer-dolomit.

Kata kunci : Alterasi, DMLZ, Geokimia, Korelasi, Porfiri-Skarn, Rasio

ABSTRACT

The Deep Mill Level Zone (DMLZ) is an underground mine located at the lowest part of the East Erstberg Skarn System (EESS) ore body on the southeast side of the Grasberg open pit mine at an elevation of 2500 - 3100 meters that is mined with a block cave system. To develop this underground mine sustainably, metallic element ratio research is needed to help identify mineralization zonation and estimate ore quality more accurately. This study aims to determine the correlation between metal elements and the relationship of metal element ratios to lithology, alteration and mineralization. The research methods carried out are field observation method with core detail logging on cores drilled in the underground mining area, rock sampling method by core drilling sampling, and laboratory analysis method in the form of petrography and mineragraphy. The stratigraphy of the study area consists of three rock units in sequence from old to young, namely the Waripi skarn-dolomite unit (Paleocene), Waripi marble-dolomite (Paleocene - Pliocene) and Ertsberg diorite (Pliocene). The developed alteration zones are divided into six zones namely k-feldspar + quartz + secondary biotite + magnetite ± sericite ± anhydrite (potassic) alteration zone, chlorite + quartz ± epidote ± sericite ± anhydrite ± magnetite (propylitic) alteration zone, garnet + epidote-chlorite + anhydrite + magnetite + quartz (endoskarn) alteration zone, magnetite + serpentine + epidote + anhydrite ± garnet ± tremolite (magnetite exoskarn), tremolite + serpentine + epidote + anhydrite + phlogopite ± magnetite alteration zone (tremolite - serpentine exoskarn) and tremolite + talc + anhydrite alteration zone (tremolite - talc exoskarn). Mineralization zones are divided into four zones, namely pyrite + chalcopyrite mineralization zone, pyrite + chalcopyrite ± molybdenite mineralization zone, bornite + chalcopyrite + pyrite ± covellite zone and pyrite + chalcopyrite ± sphalerite ± galena mineralization zone. The correlation of metal element content is divided into two, namely positive correlation with elements Cu vs Au, Cu vs Ag, Pb vs Zn, Au vs Ag, Ag vs Zn, Ag vs Pb, Cu vs Zn, Cu vs Pb, Cu vs Mo, Au vs Zn, Au vs Pb, Ag vs Mo, Zn vs Mo and negative correlation with elements Au vs Mo, Pb vs Mo. The metal element ratio relationship is divided into four ratios, namely Au/Cu produces higher ratio values as depth decreases and towards distal skarn (tremolite - talc exoskarn) in marble-dolomite lithology from the center of the porphyry (potassic) in diorite lithology, Ag/Au produces values that tend to be constant and low in diorite and skarn-dolomite lithology, Potassic alteration, endoskarn, magnetite and tremolite-serpentine exoskarn and increases slightly at the end of the drillhole in the marble-dolomite lithology and tremolite-talek exoskarn alteration showing Au values greater than Ag meaning gold enrichment is dominant over silver which is minor. Cu/Mo values decrease with depth in diorite lithologies with endoskarn, potassic and propylitic alteration due to the influence of pressure and hydrothermal fluids. The (Ag×Au)/(Cu×Mo) ratio decreases at depth and increases at shallow parts, indicating sub-ore zones in the diorite intrusions and supra-ore zones or margins of porphyry/skarn systems in the marble-dolomite lithologies.

Keywords: Alteration, DMLZ, Geochemistry, Correlation, Porphyry-Skarn, Ratio