

SARI

Daerah penelitian yaitu daerah Mekarbakti, Kabupaten Garut, Jawa Barat berpotensi memiliki prospek endapan epitermal sulfidasi rendah karena berada pada provinsi metalogeni *Central Sunda Arc Au-Ag Province*, yang didominasi oleh endapan epitermal sulfidasi rendah-menengah yang berasosiasi dengan batuan magmatik-vulkanik berumur Tersier. Penelitian mengenai karakteristik alterasi batuan samping dan mineralisasi bijih di daerah Mekarbakti dan sekitarnya menjadi sangat penting untuk dilakukan dalam rangka mengetahui karakteristik alterasi batuan samping, mineralisasi bijih, geokimia batuan samping, dan fluida hidrotermal di daerah penelitian sehingga dapat diinterpretasikan mengenai model genetik endapan tersebut sebagai acuan dalam kegiatan eksplorasi di masa mendatang dan pemahaman mengenai model endapan mineral pada Pegunungan Selatan Jawa Barat. Metode penelitian yang digunakan meliputi petrografi, mikroskopi bijih, XRD, ICP-AES-MS, dan mikrotermometri inklusi fluida. Alterasi hidrotermal yang berkembang di daerah penelitian berada pada batuan samping berupa lava andesit, tuf, dan lapili. Zonasi alterasi hidrotermal yang berkembang meliputi alterasi propilitik (klorit + illit + smektit \pm epidot), argilik (kaolinit + illit + smektit + kuarsa), dan silisifikasi (kuarsa + illit + kaolinit). Mineralisasi di daerah penelitian berkaitan dengan tekstur urat *massive*, *brecciated*, *comb*, *cockade*, dan *stockwork*. Mineral bijih yang berkembang di daerah penelitian diantaranya adalah pirit, kalkopirit, sfalerit, galena, pirhotit, kovelit, kalkosit, akantit, emas, perak, hematit, dan goetit. Faktor geologi yang dominan mengontrol alterasi dan mineralisasi di daerah penelitian adalah struktur geologi sesar berorientasi NW-SE yang didefinisikan sebagai struktur *pra-syn* mineralisasi. Alterasi propilitik mengalami pengurangan massa sebesar (-0,75%), unsur yang mengalami penambahan MnO, MgO, Fe₂O₃, Na₂O, V, Tm, dan Er sementara SiO₂, CaO, K₂O, Ba, Cr, Cs, Hf, Rb, Sn, Sr, Th, U dan UTJ lain selain Er mengalami pengurangan. Alterasi argilik mengalami penambahan massa sebesar (39,57%), unsur yang mengalami penambahan SiO₂, K₂O, BaO, Ba, Cs, Rb, Y, Zr, Nb, Hf, Dy, Er, Gd, Ho, Lu, W, Tb, Tm, dan Yb sedangkan unsur Fe₂O₃, MgO, MnO, CaO, Na₂O, Cr, Sr, Th, V, Ce, Eu, La, Nd, Pr, U, dan Sm mengalami pengurangan. Alterasi silisifikasi mengalami penambahan massa sebesar (94,83%), seluruh unsur mengalami pengurangan kecuali SiO₂, Fe₂O₃, Cr, Cs, W, dan beberapa HREE seperti Yb, Er, Tm, serta Ho. Pola UTJ pada batuan segar menandakan batuan vulkanik berhubungan dengan tatanan tektonik subduksi. UTJ pada alterasi silisifikasi secara umum mengalami penurunan yang signifikan dikarenakan penghancuran mineral primer yang membawa UTJ. HREE pada alterasi argilik relatif mengalami pengayaan diakibatkan oleh mineral sekunder illit/serisit yang dapat mengakomodasi HREE yang dilepaskan saat hancurnya mineral primer. Anomali negatif Eu pada alterasi propilitik dipengaruhi oleh penghancuran mineral plagioklas. Fluida hidrotermal yang membawa dan membentuk sistem endapan mineral di daerah penelitian memiliki kisaran temperatur pembentukan sekitar 248,05°C – 268,85°C dengan salinitas kisaran 1,01 – 1,68 wt.% NaCl eq. Perkembangan fluida yang terjadi secara umum adalah percampuran isothermal, percampuran dengan fluida yang memiliki salinitas dan suhu yang lebih rendah, serta *boiling*. Mineralisasi bijih terjadi pada kedalaman 438 – 603 m dibawah *paleosurface* dengan tekanan 33 – 55 bars. Berdasarkan seluruh karakteristik mulai dari kondisi geologi, alterasi, mineralisasi, dan fluida hidrotermal daerah penelitian termasuk tipe endapan epitermal sulfidasi rendah dalam.

Kata kunci: Mineralogi, Epitermal, Geokimia Alterasi, Inklusi Fluida, Mekarbakti

ABSTRACT

The research area, namely the Mekarbakti area, Garut Regency, West Java has a low sulphidation epithermal prospect because it is located in the Central Sunda Arc Au-Ag Province, which is dominated by low-intermediate sulphidation epithermal deposits associated with Tertiary magmatic-volcanic rocks. Study on the characteristics of wallrocks and ore mineralization in the Mekarbakti and its surroundings area is very important to be carried out in order to determine the characteristics of wallrocks alteration, ore mineralization, alteration geochemistry, and hydrothermal fluids characteristics in the research area so that it can be interpreted regarding the genetic models of mineral deposit as a reference in future exploration activities and understanding of mineral deposit models in the Southern Mountains of West Java. The research methods used include petrography, ore microscopy, XRD, ICP-AES-MS, and fluid inclusion microthermometry. Hydrothermal alteration that develops in the study area is in the wallrock in the form of andesite lava, tuff, and lapilli. The hydrothermal alteration zones that are developing include propylitic alteration (chlorite + illite + smectite \pm epidote), argillic (kaolinite + illite + smectite + quartz), and silicification (quartz + illite + kaolinite). Mineralization in the study area is related to the texture veins of massive, brecciated, comb, cockade, and stockwork. The ore minerals that develop in the research area include pyrite, chalcopyrite, sphalerite, galena, pyrrhotite, covelite, chalcocite, acanthite, gold, silver, hematite, and goethite. The dominant geological factor controlling alteration and mineralization in the study area is the NW-SE oriented fault geological structure which is defined as a pre-syn mineralized structure. Propylitic alteration experiences a mass reduction of (-0.75%), elements that experience the addition of MnO, MgO, Fe₂O₃, Na₂O, V, Tm, and Er while SiO₂, CaO, K₂O, Ba, Cr, Cs, Hf, Rb, Sn, Sr, Th, U and other REE besides Er experienced a reduction. Argillic alteration experiences an increase in mass of (39.57%), elements that experience the addition of SiO₂, K₂O, BaO, Ba, Cs, Rb, Y, Zr, Nb, Hf, Dy, Er, Gd, Ho, Lu, W, Tb, Tm, and Yb. In contrast, the elements Fe₂O₃, MgO, MnO, CaO, Na₂O, Cr, Sr, Th, V, Ce, Eu, La, Nd, Pr, U, and Sm experienced a reduction. Silicification alteration experienced a mass increase of (94.83%), and all elements experienced a reduction except for SiO₂, Fe₂O₃, Cr, Cs, W, and several HREEs such as Yb, Er, Tm, and Ho. The REE pattern in fresh rock indicated that volcanic rock was related to the subduction tectonic setting. The REE on the silicification alteration in general experienced a significant decrease because it considered primary minerals that carried the REE have been destroyed. Argillic alteration shows HREE enrichment due to illite/sericite minerals which can accommodate HREE that release during destruction of primary minerals. The negative Eu anomaly in propylitic alteration is affected by demolition of plagioclase mineral. The hydrothermal fluid that carries and forms the mineral deposit system in the study area has a formation temperature range of about 248.05°C – 268.85°C with a salinity of 1.01 – 1.68 wt.% NaCl eq. Fluid developments that occur in general are isothermal mixing, mixing with fluids having lower salinity and temperature, and boiling. The ore mineralization occurs at a depth of 438 – 603 m below the paleosurface with a pressure of 33 – 55 bar. Based on the characteristics ranging from geological conditions, alteration, mineralization, and hydrothermal fluids, the study area is classified as a deep low sulfidation epithermal deposit.

Keywords: Mineralogy, Epithermal, Alteration Geochemistry, Fluid Inclusion, Mekarbakti