

SARI

Penelitian ini dilaksanakan di kawasan Pegunungan Kulon Progo, tepatnya di Kaligono dan sekitarnya, Kecamatan Kaligesing, Jawa Tengah. Tujuan dari penelitian ini adalah untuk memahami kondisi geologi, alterasi dan mineralisasi guna karakterisasi endapan porfiri yang ada di daerah tersebut. Metode penelitian yang digunakan adalah pemetaan geologi dan alterasi, pengambilan sampel, dan analisis laboratorium. Analisis laboratorium terdiri dari analisis petrografi, mikroskopi bijih, *Fire Assay - Atomic Absorbtion Spectrometry* (FA-AAS), *Inductive Coupled Plasma-Atomic Emission Spectrometry* (ICP-AES) dan *Inductively Coupled Plasma Mass Spectrometry* (ICP-MS) serta mikrotermometri inklusi fluida. Hasil penelitian menunjukkan bahwa litologi penyusun daerah penelitian adalah andesit, diorit, dan batugamping. Satuan andesit mengalami alterasi propilitik dalam (klorit + kalsit + serisit ± aktinolit ± magnetit), propilitik luar (klorit + kalsit + epidot) dan filik (kuarsa + serisit + pirit). Satuan diorit mengalami alterasi potasik (k-feldspar + biorit + ser ± mag). Mineralisasi daerah penelitian didominasi oleh urat - urat *stockworks*. Analisis sayatan poles menunjukkan keterdepatan mineral bijih sulfida seperti pirit, kalkopirit, bornit, digenit, dan kovelit. Zona alterasi potasik di daerah penelitian diperkirakan sebagai bagian dari zona alterasi potasik terluar (paling tepi) akibat karakteristik geokimianya yang mengalami anomali (depleksi) elemen Fe_2O_3 , MgO , dan Na_2O . Mikrotermometri inklusi fluida menunjukkan bahwa temperatur homogenisasi (Th) fluida hidrotermal pembawa mineralisasi porfiri terbentuk pada temperatur antara $289^\circ\text{C} - >550^\circ\text{C}$ dengan salinitas antara 3,71 – 27,89 wt. % NaCl eq. Mineralisasi terbentuk pada kedalaman $\pm 2,8$ km dari *paleosurface* dalam kondisi tekanan ± 700 bar (70 MPa). Proses mineralisasi porfiri penelitian terbagi menjadi tahap *early mineralization* (urat kuarsa + magnetit + kalkopirit + pirit /urat tipe M dan pembentukan urat kuarsa + kalkopirit + pirit + bornit ± digenit /urat tipe A), *main mineralization* (urat kuarsa + pirit + kalkopirit /urat tipe AB) dan *late mineralization* (terbentuk urat kuarsa + pirit /urat tipe D). Hasil dari analisis *fire assay*-AAS menunjukkan batuan teralterasi potasik mengandung kadar Au batuan sebesar 0,03 – 0,37 ppm, Ag sebesar $<1 - 1$ ppm., dan Cu sebesar 0,63 % – 2,68 %.

Kata kunci: porfiri, mikrotermometri, geokimia, Pegunungan Kulon Progo



ABSTRACT

This research was conducted in the Pegunungan Kulon Progo area, precisely in Kaligono and surrounding areas, Kaligesing District, Central Java. The purpose of this research is to understand the geological conditions, alteration, and mineralization for the characterization of porphyry deposits in the area. The research methods used include geological and alteration mapping, sample collection, and laboratory analysis. Laboratory analysis consists of petrographic analysis, ore microscopy, Fire Assay - Atomic Absorption Spectrometry (FA-AAS), Inductive Coupled Plasma-Atomic Emission Spectrometry (ICP-AES), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and fluid inclusion microthermometry. The results of the research show that the lithology comprising the study area consists of andesite, diorite, and limestone. The andesite unit undergoes inner propylitic alteration (chlorite + calcite + sericite \pm actinolite \pm magnetite), outer propylitic (chlorite + calcite + epidote), and phyllic alteration (quartz + sericite + pyrite). The diorite unit undergoes potassic alteration (K-feldspar + biotite + ser \pm mag). The mineralization in the study area is dominated by vein-stockwork. Polished section analysis indicates the presence of sulfide ore minerals such as pyrite, chalcopyrite, bornite, digenite, and covellite. The potassic alteration zone in the study area is estimated to be part of the outermost (peripheral) potassic alteration zone due to its geochemical characteristics showing anomalies (depletion) of Fe_2O_3 , MgO , and Na_2O elements. Fluid inclusion microthermometry shows that the homogenization temperature (T_h) of the hydrothermal mineralization-carrying fluids ranges between $289^\circ\text{C} - >550^\circ\text{C}$ with salinity between 3,71 – 27,89 wt. % NaCl eq. Mineralization occurred at a depth of $\pm 2,8$ km from the paleosurface under a pressure condition of ± 700 bar (700 MPa). The porphyry mineralization process in the study area is divided into early mineralization stage (quartz vein + magnetite + chalcopyrite + pyrite / M-type veins), main mineralization stage (formation of quartz vein + chalcopyrite + pyrite + bornite \pm digenite / A-type veins and quartz vein + pyrite + chalcopyrite / AB-type veins), and late mineralization stage (formation of quartz vein + pyrite / D-type veins). The results of the fire assay-AAS analysis indicate that the potassic altered rock contains gold (Au) in the range of 0.03 – 0.37 ppm, silver (Ag) in the range of $<1 - 1$ ppm, and copper (Cu) in the range of 0,63 % – 2,68 %.

Keywords: porphyry, microthermometry, geochemistry, Kulon Progo Mountains

