

GEOLOGI, ALTERASI DAN MINERALISASI EMAS TIPE CARLIN DI DAERAH RATATOTOK SELATAN, KECAMATAN RATATOTOK, KABUPATEN MINAHASA TENGGARA, PROVINSI SULAWESI UTARA

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ABSTRAK

Ratatotok Selatan merupakan salah satu daerah di Sulawesi Utara yang pernah menjadi daerah penghasil emas. Endapan emas tipe Carlin pada Prospek Memiliki sumberdaya sebesar 12.25 juta ton @5.21 g/t Au. Di dekat Prospek Mesel, mineralisasi emas sebenarnya juga ditemukan pada beberapa prospek, seperti Prospek Leon, Bulex Hill, Heind's Find dan Mongkey Forest. Untuk menentukan arah kegiatan eksplorasi pada ke-empat prospek tersebut, kondisi geologi, alterasi dan mineralisasi di daerah ini pada skala yang lebih rinci penting untuk diketahui. Tujuan penelitian ini adalah untuk mengkaji karakteristik geologi yang mengontrol alterasi dan mineralisasi, mengetahui karakteristik alterasi dan mineralisasi, dan membuat model genetik endapan emas di daerah penelitian. Penelitian dibagi menjadi beberapa tahapan yaitu pendahuluan, pekerjaan lapangan, pekerjaan laboratorium (melibatkan analisis petrografi, *X-Ray Diffraction*, mikroskopi bijih, ICP-MS dan *fire-assay*), dan tahap akhir dan pelaporan. Hasil penelitian menunjukkan bahwa litologi batugamping dan breksi serta struktur geologi berarah relatif utara-selatan, barat laut – tenggara dan barat daya – timur laut merupakan pengontrol alterasi dan mineralisasi di daerah penelitian. Alterasi yang berkembang dibagi menjadi empat zona yaitu alterasi silisifikasi, karbonatisasi, agilik dan propilitik. Mineral bijih yang ditemukan tersebar secara *disseminated* dan terdiri dari pirit, markasit, arsenopirit, stibnit, realgar, orpiment, hematit dan goetit. Sementara mineral *gangue* meliputi kuarsa, kalsit, dolomit, gipsum, klorit, kaolinit, *mix* ilit/smektit, *mix* klorit/smektit dan *corrensite*. Mineralisasi emas hanya teridentifikasi dari hasil analisis kadar pada sampel teralterasi silisifikasi. Secara geokimia, oksida/unsur SiO₂, Al₂O₃, Fe₂O₃, K₂O, MnO, Cr₂O₃, Au, Ag, As, Cu, Pb, Zn, Sb, Mo, Tl, Co, Cd, Li, Ni, Sc, Ba, Cr, Cs, Ga, Hf, Nb, Rb, Sn, Ta, Th, U, V, W, Y, Zr, Hg dan Ni mengalami penambahan konsentrasi, sementara CaO, MgO, Na₂O dan Sr mengalami penurunan nilai konsentrasi. Kadar emas dari tujuh sampel yang dianalisis rata-rata 1.37 g/t, di mana kadar Au berkorelasi positif terhadap As, Sb, minor Cu, Pb, Zn, dan Ag serta berkorelasi negatif terhadap Hg. Model Ienetic pembentukan mineralisasi emas di daerah penelitian dibagi menjadi enam tahapan yaitu (1) pengendapan batugamping di lingkungan laut dangkal, (2) Pengangkatan, intrusi andesit porfiri dan pengendapan breksi (3) aktifnya magmatisme berupa intrusi dalam sebagai sumber fluida pembawa mineralisasi bijih, (4) peningkatan interaksi fluida hidrotermal dengan batugamping, (5) terbentuknya fluida hidrotermal *barren*, dan (6) pembentukan endapan koluvial dan pengkayaan supergen.

Kata kunci: *Alterasi hidrotermal, mineralisasi emas tipe Carlin, model genetik endapan emas, Ratatotok Selatan.*

ABSTRACT

South Ratatotok is one of the regions that was once a gold-producing region in North Sulawesi. Mesel gold deposit in this region are approved as Carlin type gold deposit with a total of resources of 12.25 Mt @5.21 g/t Au. Near the Mesel deposit, gold mineralization is currently discovered several prospects such as Leon, Bulex Hill, Heind's Find and Monkey Forest. In order to determine the direction of exploration activities in these four prospects, it is important to know the geological conditions, alteration and mineralization in this area at a more detailed scale. This research aims to study the geological factors that control alteration and mineralization, to understand the characteristics of hydrothermal alteration and mineralization, and to build a genetic model of the gold mineralization in the study area. The research is divided into several stages which are preliminary study, fieldwork, laboratory work (involving petrographic analysis, X-ray diffraction, ore microscopy, ICP-MS and fire assay), and reporting. The results showed that lithology (limestone and breccias) and geological structures trending relatively north-south, northwest-southeast and southwest-northeast are the geological factors that controlled alteration and mineralization in the study area. The hydrothermal alteration are divided into four zones, namely silicification, carbonatization, argillic and propylitic alteration. Ore minerals found consist of pyrite, marcasite, arsenopyrite, stibnite, realgar, orpiment, hematite and goethite. Meanwhile, gangue minerals include quartz, calcite, dolomite, gypsum, chlorite, kaolinite, mixed-layer illite/smectite, mixed-layer chlorite / smectite and corrensite. Gold mineralization was only identified from the fire assay analysis toward the silicified limestone. Geochemically, SiO₂, Al₂O₃, Fe₂O₃, K₂O, MnO, Cr₂O₃, Au, Ag, As, Cu, Pb, Zn, Sb, Mo, Tl, Co, Cd, Li, Ni, Sc, Ba, Cr, Cs, Ga, Hf, Nb, Rb, Sn, Ta, Th, U, V, W, Y, Zr, Hg and Ni have increased during the silicification alteration, while CaO, MgO, Na₂O and Sr experience a depletion. The average gold content of the seven samples analyzed was 1.37 g / t, where the Au content had a positive correlation with As, Sb, minor Cu, Pb, Zn, and Ag and negatively correlated with Hg. The genetic model for gold mineralization in the research area is divided into six stages, namely (1) limestone deposition in shallow marine environment, (2) uplifting, intrusion of porphyritic andesite and deposition of breccias (3) active magmatism in the form of intrusion acting as fluid sources of ore mineralization, (4) increased hydrothermal fluid interaction with limestone, (5) formation of barren hydrothermal fluids, and (6) coluvial deposits deposition and supergene enrichment.

Keywords: Hydrothermal alteration, Carlin type gold mineralization, gold deposit, genetic model, South Ratatotok.