

INTISARI

Kompleksitas aktivitas magmatisme dan asosiasinya dengan Sesar Besar Sumatra terutama pada Zaman Neogen menciptakan jalur mineralisasi epitermal “*Neogene Gold Belt*”, salah satunya adalah Martabe. Deposit Martabe memiliki karakteristik Kompleks Kubah Batangtoru, yang mana adanya indikasi pada data *dating* dan karakteristik kubah pada deposit lain, menunjukkan adanya kemungkinan peristiwa magmatisme lanjutan pada sistem kubah ini. Sejauh ini, penelitian pada Martabe dominan berada pada daerah pit aktif pada wilayah yang lebih distal dari kompleks kubah ini, sehingga diperlukan penelitian lanjutan untuk mengetahui potensi dan karakter endapan pada kompleks kubah ini. Penelitian kali ini berada pada Prospek Tor Uluala dan Ramba Joring Utara pada wilayah proksimal Kompleks Kubah Batangtoru. Penelitian ini akan membahas mengenai kondisi geologi, karakteristik alterasi hidrotermal, mineralisasi bijih, serta karakteristik fluida hidrotermal pada daerah penelitian yang belum diteliti sebelumnya.

Penelitian kali mencakup pemetaan geologi dan diintegrasikan dengan analisis petrografi, mineragrafi, ASD (*Analytical Spectral Devices*), XRF (*X-Ray Fluorescence*), inklusi fluida, maupun data sekunder lain. Hasilnya, daerah penelitian berkembang pada sistem proksimal vulkanik purba, dengan karakteristik geomorfologi berupa kubah intrusi andesit hornblenda, yang diterobos oleh aktivitas freatomagmatik yang membentuk satuan breksi. Struktur geologi yang berkembang dibedakan menjadi *post* mineralisasi, serta *pre-syn* mineralisasi yang mengontrol perkembangan alterasi dan mineralisasi pada daerah penelitian yang didukung oleh sifat permeabilitas dari breksi freatomagmatik ini. Zona alterasi daerah penelitian dari proksimal ke distal berupa silika *vuggy*, argilik lanjut ($\text{silika} \pm \text{alunit} \pm \text{dikit} \pm \text{kaolinit}$), argilik ($\text{kaolinit} \pm \text{smektit-illit} \pm \text{illit}$), dan propilitik ($\text{klorit-smektit} \pm \text{kalsit}$). Mineralisasi berkembang dengan disseminasi, pengisian pada rongga (*vug*) dan *veinlet*, secara hipogen melalui kehadiran pirit, enargit, tenanit, dan minor galena-sfalerit. Ditemukan pula adanya indikasi *overprinting* dengan urat epitermal sulfidasi rendah melalui keterdapatan urat kuarsa tekstur *banded*. Adanya peristiwa oksidasi dan supergen menyebabkan karakteristik zonasi sebaran logam daerah penelitian yang dibedakan menjadi zona sulfida ($\text{Cu-As-Au-Ag} \pm \text{Pb-Zn}$), zona transisi melalui kehadiran kovelit dan kalkosit (Cu-S), dan zona oksida ($\text{Au-Ag-As} \pm \text{Pb-Zn}$). Keterdapatan emas dan perak pada zona sulfida diinterpretasikan berasosiasi dengan mineral sulfida lain sebagai *invincible gold*, sedangkan pada zona oksida sebagai *free-grain* akibat proses pencucian. Daerah penelitian termasuk tipe endapan epitermal sulfidasi tinggi pada kedalaman intermediet – dangkal.

Kata kunci : Tor Uluala, Ramba Joring Utara, Epitermal Sulfidasi Tinggi

ABSTRACT

The complexity of magmatic activity and its association with the Sumatra Fault System, particularly during the Neogene period, has led to the formation of the "Neogene Gold Belt," one of which is the Martabe deposit. The Martabe deposit is characterized by the Batangtoru Dome Complex, where dating data and dome characteristics from other deposits indicate the possibility of continued magmatic events within this dome system. So far, research on Martabe has predominantly focused on active pit areas located distally from this dome complex. Therefore, further studies are needed to assess the potential and characteristics of the mineralization within the dome complex itself. This study is conducted in the Tor Uluala and North Ramba Joring prospects, which are located in the proximal zone of the Batangtoru Dome Complex. It aims to examine the geological conditions, hydrothermal alteration characteristics, ore mineralization, and hydrothermal fluid characteristics in the research area, which has not been extensively studied before.

This research integrates geological mapping with petrography, ore microscopy, Analytical Spectral Devices (ASD), X-Ray Fluorescence (XRF), fluid inclusion analysis, and other secondary data. The results indicate that the research area developed within a proximal paleo-volcanic system, characterized by hornblende andesite intrusive domes, which were subsequently intruded by phreatomagmatic activity forming breccia units. The geological structures identified are classified into post-mineralization and pre-syn mineralization structures, which control the development of alteration and mineralization in the study area, supported by the permeability of the phreatomagmatic breccia. The alteration zones from proximal to distal include vuggy silica, advanced argillic (silica \pm alunite \pm dickite \pm kaolinite), argillic (kaolinite \pm smectite-illite \pm illite), and propylitic (chlorite-smectite \pm calcite). Mineralization occurs as dissemination, cavity (vug) filling, and veinlet infill. Hypogene mineralization is indicated by the presence of pyrite, enargite, tennantite, and minor galena-sphalerite. Evidence of overprinting with low-sulfidation epithermal veins is observed through banded-textured quartz veins. Oxidation and supergene processes have resulted in a zonation of metal distribution, distinguishing sulfide zones (Cu-As-Au-Ag \pm Pb-Zn), transition zones with covellite and chalcocite (Cu-S), and oxide zones (Au-Ag-As \pm Pb-Zn). Gold and silver occurrences in the sulfide zone are interpreted to be associated with other sulfide minerals as invisible gold, whereas in the oxide zone, they occur as free grains due to leaching processes. The study area is classified as a high-sulfidation epithermal deposit formed at an intermediate to shallow depth.

Keywords: Tor Uluala, North Ramba Joring, High-Sulfidation Epithermal