

SARI

Pulau Bangka merupakan bagian dari jalur timah Asia Tenggara yang kaya akan endapan timah, khususnya endapan sekunder hasil pelapukan granit pembawa kasiterit. Penelitian ini bertujuan untuk mencari karakteristik jenis, kelimpahan, dan sifat fisik mineral pembawa timah serta mineral ikutan timah (MIT), termasuk hubungan korelasi antar mineral, serta mengestimasi sumber daya timah menggunakan metode *Ordinary Kriging* (OK) berdasarkan data pengeboran eksplorasi di Desa Kemingking, Kecamatan Sungai Selan, Kabupaten Bangka Tengah. Data yang digunakan terdiri atas data primer berupa lima sampel pasir lepas hasil pengeboran eksplorasi yang dipersiapkan menjadi konsentrat mineral berat dan dianalisis menggunakan metode *grain counting analysis* (GCA) pada fraksi ukuran 300–210 μm , 210–150 μm , 150–75 μm , dan <75 μm , serta perhitungan indeks ZTR (Zirkon–Turmalin–Rutil). Data sekunder berupa hasil pengeboran dari 56 titik digunakan dalam estimasi sumber daya. Hasil penelitian menunjukkan bahwa mineral utama pembawa timah adalah kasiterit dengan kelimpahan rata-rata 0,0158% berat total sedimen. Mineral ikutan yang ditemukan meliputi zirkon (0,0237% berat), ilmenit (0,0137% berat) dan monasit/senotim (0,0095% berat). Kasiterit, ilmenit, dan monasit/senotim lebih banyak terkonsentrasi pada fraksi 210–75 μm , sedangkan zirkon pada fraksi 150–<75 μm , menandakan adanya penyortiran selektif. Kasiterit menunjukkan zonasi kristal dan warna kemerahan–kekuningan, sedangkan zirkon menunjukkan bentuk prismatik hingga *rounded* yang mengindikasikan proses sedimentasi berulang. Korelasi antar mineral menunjukkan hubungan pengayaan mineral yang negatif antara kasiterit dan MIT, terutama pada fraksi halus (<150 μm), akibat perbedaan densitas. Nilai indeks ZTR berkisar antara 29–81% (*immature* – *mature*) dengan rata-rata 49% (*immature*), mencerminkan tingkat kematangan mineralogi dari *immature* hingga *mature*. Berdasarkan asosiasi mineral berat, batuan sumber endapan aluvial di daerah penelitian berasal dari granit tipe I dan S serta batuan sedimen hasil pengendapan berulang. Estimasi sumber daya timah dilakukan menggunakan metode *ordinary kriging* dengan dimensi model blok $4 \times 4 \times 1$ m pada rentang kedalaman 3,4–30,4 m. Hasilnya menunjukkan total sumber daya timah sekitar 2.500–6.500 ton dengan volume total 35 juta m^3 dan kadar rata-rata 0,07–0,19 kg/m^3 . Berdasarkan klasifikasi sumber daya, diperoleh kategori terukur sebesar 660–1.400 ton timah, tertunjuk sebesar 1.200–3.350 ton timah, dan tereka sebesar 620–1.800 ton timah. Zona utama pengendapan timah berada pada kedalaman 9,4–18,4 m dengan arah anisotropi utama $\text{N}45^\circ\text{E}$ berdasarkan analisis *variogram*, yang merepresentasikan arah utama mineralisasi timah dan berpotensi mengandung mineral ikutan ekonomis seperti ilmenit, zirkon, dan monasit/senotim terutama pada kedalaman lebih dari 18,4 m ketika kadar timah mulai menurun.

Kata kunci : Timah, MIT, Kemingking, *Grain counting analysis*, *Ordinary Kriging*

ABSTRACT

Bangka Island is part of the Southeast Asian tin belt, which is rich in tin deposits, particularly secondary deposits resulting from the weathering of cassiterite-bearing granite. This study aims to characterize the types, abundance, and physical properties of tin-bearing minerals and associated tin minerals (ATMs), including the correlation relationships between minerals, as well as to estimate tin resources using the Ordinary Kriging (OK) method based on exploration drilling data from Kemingking Village, Sungai Selan Subdistrict, Central Bangka Regency. The data used include primary data consisting of five unconsolidated sand samples obtained from exploration drilling, which were processed into heavy mineral concentrates and analyzed using the grain counting analysis (GCA) method for grain size fractions of 300–210 μm , 210–150 μm , 150–75 μm , and <75 μm , along with the calculation of the ZTR index (Zircon–Tourmaline–Rutile). Secondary data derived from 56 drilling points were used for resource estimation. The results show that the main tin-bearing mineral is cassiterite, with an average abundance of 0.0158 wt%. The associated minerals identified include zircon (0.0237 wt%), ilmenite (0.0137 wt%), and monazite/xenotime (0.0095 wt%). Cassiterite, ilmenite, monazite/xenotime are more concentrated in the 210–75 μm fraction, while zircon is more abundant in the 150–<75 μm fraction, indicating selective sorting. Cassiterite exhibits crystal zoning and a reddish to yellowish-brown color, while zircon displays prismatic to rounded grain shapes, indicating repeated sedimentation cycles. The correlation between minerals shows a negative enrichment relationship between cassiterite and ATMs, particularly in finer fractions (<150 μm), due to differences in mineral density. The ZTR index ranges from 29–81% (immature – mature), with an average value of 49% (immature), reflecting a mineralogical maturity level from immature to mature. Based on the association of heavy minerals, the source rocks of the alluvial deposits in the study area are derived from I- and S-type granites as well as sedimentary rocks formed through repeated depositional processes. The tin resource estimation was carried out using the Ordinary Kriging method with a block model dimension of $4 \times 4 \times 1$ m within a depth range of 3.4–30.4 m. The results indicate a total tin resource of approximately 2,500–6,500 tons with a total volume of 35 million m^3 and an average grade of 0.07–0.19 kg/m^3 . Based on the resource classification, the measured tin resource accounts for 660–1,400 tons, the indicated tin resource for 1,200–3,350 tons, and the inferred tin resource for 620–1,800 tons. The main tin deposition zone is located at depths of 9.4–18.4 m with a principal anisotropy direction of N45°E, as determined from variogram analysis, representing the primary trend of tin mineralization and potentially containing economically valuable accessory minerals such as ilmenite, zircon, and monazite/xenotime, particularly at depths greater than 18.4 m where tin grades begin to decrease.

Keywords : Tin, tin-associated minerals, Kemingking, Grain counting analysis, Ordinary Kriging