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Abstract Index

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Geotechnical Evaluation of Landslide Through a Back Analysis Approach on the Disposal Area Slope at Pit 'X', Tanjung Enim, South Sumatra

Evaluasi Geoteknik Kelongsoran dengan Pendekatan Analisis Balik pada Lereng Area Disposal Pit 'X', Tanjung Enim, Sumatra Selatan

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P. 73-84

In open pit mining, the main activities include excavating the material from its original state and transporting it to the disposal area or stockpile, which forms an embankment. Slope stability in the disposal area should be monitored regularly to prevent losses caused by landslides. If a landslide occurs, it is important to identify the cause as a basis for recommending new slope design and implementing appropriate engineering measures to prevent future landslide occurrences. This study was conducted on a slope that had experienced a landslide in the Pit 'X' disposal area, Tanjung Enim, South Sumatra. This study aims to analyze the cause of the landslide by using a back analysis approach. Slope stability analysis was conducted using the Morgenstern-Price boundary equilibrium method, with failure probabilities calculated using Slide 2 software. Input data consisted of cohesion, internal friction angles, and unit weight of slope material. Based on the slope stability analysis, landslides occurred on slopes with a safety factor of 1 and a 40% probability of failure. This was caused by a 67.43% decrease in cohesion caused by the water-saturated condition of the clay material and the influence of the steep slope geometry. The proposed engineering solutions include slope grading, which increases the factor of safety by 30.31%, and the addition of counterweights, which further increases the factor of safety by 32.10%.

Keywords: disposal area, back analysis, slope stability analysis, safety factor, limit equilibrium method

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Physical Beneficiation of Low-Grade Chromite Sand Using a Shaking Table and Davis Tube

***Benefisiasi Fisik pada Pasir Kromit Kadar Rendah Menggunakan Meja Goyang dan* Davis Tube**

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The rapid growth of the global steel industry has significantly intensified the demand for the metallurgical-grade chromite ore required for ferrochrome production. This surge has led to a depletion of high-grade chromite reserves, necessitating the utilization of low- and medium-grade chromite to support a stable raw material supply for ferrochrome. This research was conducted to determine the characteristics of the ore and to analyze the effects of physical beneficiation processes using shaking table and Davis tube in enhancing the chromium (Cr) grade and the Cr : Fe ratio of low-grade chromite sand from Morowali, Central Sulawesi. The characterization process was conducted using XRF, XRD, and SEM-EDS. Experimental parameters for the shaking table included variations in table inclination and water flow rate, while magnetic separation was analyzed across various electric current intensities. The optimal shaking table test results were achieved at an inclination of 7.5° with a water flow rate of 18 liters/minute. In contrast, the optimal test using the Davis tube was obtained at an electric current of 0.4 amperes (660 gauss). This integrated process successfully increased Cr grade from 8.5% to 20.77% (corresponding to Cr2O3 30.36%) and improved the Cr : Fe ratio from 0.97 to 1.62, achieving a recovery rate of 94.93%.

Keywords: chromite sand, Davis tube, ferrochrome, and shaking table

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Harnessing Advanced Materials and Extractive Metallurgy for Optimizing Mineral and Energy Resource Value Chains

Memanfaatkan Material Maju dan Metalurgi Ekstraktif untuk Mengoptimalkan Rantai Nilai Sumber Daya Mineral dan Energi

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P. 101-117

This study explores recent advances in advanced materials and extractive metallurgy aimed at optimizing mineral and energy resource value chains. The objective is to synthesize current research, emerging technologies, and future prospects in value chain optimization. The novelty lies in a comprehensive analysis of synergies between advanced materials, innovative extractive techniques, and cutting-edge technologies such as AI and biotechnology. A systematic literature review was conducted, focusing on peer-reviewed publications from 2018 onwards, with data extracted and analyzed using standardized formats and qualitative software. Key findings highlight notable improvements in extraction efficiency and selectivity through nanostructured materials and high-performance membranes, showing lab-scale efficiency gains of 50–70%, translating to 20–30% in industrial settings. Bio-inspired techniques in extractive metallurgy have demonstrated potential in reducing energy consumption by up to 40% in certain processes. The integration of AI and machine learning has also shown promise in optimizing complex ore beneficiation and enhancing overall recovery rates. The study further discusses challenges in scaling laboratory

innovations to industrial applications, particularly the need to address hidden environmental costs associated with new technologies. Limitations include the exclusion of non-English studies and the potential lag in capturing the latest advancements. This review provides insights for researchers, industry professionals, and policymakers to promote sustainable and efficient resource utilization, while emphasizing the transformative role of advanced materials, extractive metallurgy innovations, and emerging technologies in reshaping resource value chains.

Keywords: advanced materials, extractive metallurgy, sustainability, mineral and energy, resource value chains

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Thiansy, Elsy; Cahyadi, Tedy A.; and Haq, Shofa R. (UPN 'Veteran" Yogyakarta)
Comparative of RANS and LES Simulations in Flow Pattern Modeling: Literature Review
Perbandingan Simulasi* RANS *dan* LES *dalam Pemodelan Pola Aliran: Kajian Literatur
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P. 119-129

The fidelity of turbulent flow modelling is critical aspect in engineering design. This study conducts comparative assessment of Reynolds-Averaged Navier–Stokes (RANS) and Large Eddy Simulation (LES) models in Computational Fluid Dynamics (CFD) through a literature review. The findings show that RANS is efficient for large-scale simulations with low computational cost but less accurate in capturing turbulence details. LES, on the other hand, offers higher accuracy in representing turbulent structures but requires much greater computational resources. This review concludes that the determination of an optimal modeling framework necessitates a balanced consideration of computational resource constraints, simulation domain scale, and the required level of predictive accuracy.

Keywords: CFD, flow characteristics, turbulence, RANS, LES

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Sjahboeddin, Buana; Harjono, Dhaniswara K.; Nainggolan, Bernard; and Simatupang, Dian P. (Universitas Kristen Indonesia)
Regulation on Increasing Added Value of Nickel and Mineral Mining Business Opportunities and Challenges in Indonesia
Regulasi Peningkatan Nilai Tambah Nikel dan Peluang serta Tantangan Bisnis Pertambangan Mineral di Indonesia
IMJ, Vol. 28, No. 2, October 2025,
P. 131-146

This study provides a doctrinal examination of Indonesia's legal framework regulating the increase of added value in nickel mining, with a particular focus on the coherence and enforceability of downstream mineral regulations. Employing a normative legal method combining statutory, conceptual, and analytical approaches, the research assesses the alignment between primary legislation—Law No. 4 of 2009 on Mineral and Coal Mining, as amended by Law No. 3 of 2020 and most recently by Law No. 2 of 2025—and its derivative instruments, including Government Regulation No. 23 of 2010 and successive ministerial regulations. Secondary legal materials, official government reports, international publications, and documented statistical data on nickel production and exports are examined to evaluate the extent to which the regulatory framework promotes domestic processing, legal certainty, and sustainable management of natural resources in accordance with the constitutional mandate of Article 33 of the 1945 Constitution. The findings indicate that regulatory interventions have substantively expanded domestic processing capacity and generated downstream investment, reaching approximately USD 5.03 billion, while increasing Indonesia's nickel export value from USD 1.3 billion in 2021 to USD 6.8 billion in 2023. However, despite these economic outcomes, significant normative inconsistencies persist, including fragmented regulatory mandates, inadequate harmonization between central and sectoral regulations, and limited institutional capacity in licensing and supervision. These weaknesses manifest in ore–smelter imbalances, unequal distribution of benefits, and escalating environmental degradation, particularly deforestation, marine sedimentation, and heavy-metal contamination around mining areas. Such conditions reveal a structural discrepancy between the normative objectives of downstreaming and the principles of environmental protection, community rights, and sustainable governance mandated by Article 33 of the 1945 Constitution. This research contributes to the legal discourse by demonstrating that Indonesia's nickel downstreaming framework remains predominantly instrumental and growth-oriented, lacking a coherent integration of environmental law, administrative accountability, and welfare-state obligations. Strengthening regulatory certainty requires harmonization of derivative regulations, binding environmental enforcement, and institutional safeguards to ensure equitable benefit distribution and long-term public welfare. These measures are crucial in operationalizing constitutional mandates and reinforcing the legitimacy of mineral governance in Indonesia.

Keywords: nickel mining, legal regulation, downstream policy, added value, environmental governance