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Photo caption: Tanjunggenting Reverse Fault, Bangka (Contributor:Heri Syaeful)

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Table of Content

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e-ISSN 2503-426X

EKSPLORIUM

Buletin Pusat Pengembangan Bahan Galian Nuklir
Volume 43, No. 1, May 2022

Review on Granitic Rocks in Sumatra: Intrusion Process, Classification, Mineralization, and Potential Uses

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ABSTRACT

Granitic rocks are widely distributed in Sumatra and surrounding areas. These granitoids are classified into several granite provinces of Southeast Asia with different intrusion processes and specific characteristics. This paper aims to review the intrusion of granitic rocks in Sumatra and describe the opportunities associated with it. Granite rocks are used to manufacture cultural heritage, works of art, and ornaments because of their weathering resistance, color diversity, and hardness characters. S-type granite intrusion in Sumatra might be associated with tin mineralization while silver-gold with the I-type. Theoretically, granite contains more REE than other igneous rocks. Mining and extraction difficulties complicate the direct REE exploitation from fresh granite. A-type granite relatively contains more REE than the other types, but this type of granite is not correlated with certain provinces. Indonesia has a tropical climate which is prone to weathering. Therefore, it is possible for REE and/or bauxite enrichments in the granite weathering horizon. Granite is assumed to be a potential source of uranium and thorium, especially for the S-type, because it is formed through the compression of sediments that can absorb these radioactive elements from the continental crust.

Keywords: Sumatra, granite, classification, mineralization

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Ore Mineralization Characteristics in Hydrothermal Alteration at Mangunharjo and Surrounding Area, Pacitan, Indonesia

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ABSTRACT

The research area is located in Mangunharjo-Grindulu, Pacitan (Indonesia), as part of the Southern Mountain Tertiary Volcanic Arch. Outcrops of quartz veins-riched volcanic rock associated with sulfide minerals are found in this area. The Southern Mountain Oligo-Miocene magmatic arc is known as the potential area that contains precious metal deposits. The study aimed to determine the characteristics of the mineralized zone in this area. The research methods are geological surface mapping, thin-section observation, mineragraphy, and X-Ray Diffraction (XRD). The results show that the constituent lithologies were andesitic lava, breccia, and tuff; co-ignimbrite breccia, dacitic pumice and tuff, and dacitic dike; and pyroxene-rich andesitic volcanic rocks. The geological structure is dominated by oblique normal faults, strike-slip faults, and upward oblique faults associated with shear joints filled with quartz veins. Fieldwork observation, thin-section analyses, and mineragraphic and XRD observations identify three alteration zones in the hydrothermal system: the advanced argillic zone, the intermediate argillic zone, and the chloritized zone. By the mineral's association, it is interpreted that the advanced argillic zone was formed at a temperature of 220-330^{o}C and pH 3-6 due to dissemination with side rocks located near the hydrothermal flows; the intermediate argillic zone and the chloritized zone were formed at a temperature of 150-300^{o}C and a pH of 5-6 due to chloritized alteration of the hydrothermal fluid carrying the ore. This alteration zone has no economic potential for precious metal minerals so it is better to be developed for education, conservation, and natural laboratories.

Keywords: Geology, Ore Mineralization, Hydrothermal Alteration

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Sub-surface Geological Modeling Based on Gravity Residual Data in Adang Volcanic Rock Area, Mamuju, West Sulawesi Province

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ABSTRACT

The Mamuju area of West Sulawesi Province is composed of Adang volcanic rock that is a product of the process of volcanism in a volcanic complex with an eruption center and several lava domes. The geology of the study area is composed of eleven rock units, namely Adang breccia, Adang lava, lava dome, volcanic conglomerate, Ampalas breccia, Malunda breccia, Boteng lava, Tapalang breccia, limestone, reef limestone, and alluvium. The mineralization of uranium, thorium, and rare earth elements formed in Adang lava thorianite veins. Adang lava is intruded by a dioritoid found in the Mamuju river upstream. The gravity modeling technique has produced two 2-D subsurface models based on gravity data on 2-D cross-sections of the residual gravity map. It is known that the rock density range from 2.10 to 2.85 g/cm^3 in the study area. Based on the interpretation of two 2-D subsurface models, a batholith, a giant-sized intrusive rock, is found in the southeastern part of the study area with a rock density of about 2.85 g/cm^3 and is interpreted to be dioritoids. Furthermore, deep intrusion rocks also occur in the center part of the study area with a rock density of 2.8 g/cm^3. It is estimated to be the same as the rock in the southeastern part of the study area. Dioritoid intrudes a volcanic breccia sedimentary rock with a density of about 2.1 g/cm^3.

Keywords: Mamuju, gravity, modeling, density, batholith

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Tectonic Pattern Imaging of Southern Sumatra Region Using Double Difference Seismic Tomography

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ABSTRACT

Southern Sumatra and its surroundings are close to the contact zone of the Indo-Australian plate and Eurasian plate, so the area always relates to the high seismicity zone. The Sumatran subduction zone, the Mentawai fault, and several segments of the Sumatran fault drive seismic activities in the area. Tectonic settings are essential to understanding the area's source and hazard. This understanding can be obtained using the relocated hypocenter distribution and the 3D velocity model in the area. Relocated hypocenters and velocity models are obtained from simultaneous inversion from the BMKG earthquake catalog in January 2012-December 2020 using the double difference seismic tomography method. Seismic velocity inversion of P- and S- wave tomograms image the thermal zone beneath Dempo and Patah volcanoes at a depth of 30-50 km. Slab dehydration is also observed in several forearc high zone. Both phenomena are associated with negative anomalies. The Sumatran and Mentawai fault zones are marked between negative and positive anomalies on the contact zone. The subducted slab of the Indo-Australian plate is observed until a depth of 150 km, which is the maximum depth of nodes used in this study. The granitic basement beneath Anak Krakatau volcano is detected until 10 km. Two of those geological features are related to positive anomalies.

Keywords: seismic tomography, double difference, Southern Sumatra

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Geostatistical Ore Body Modeling on Uranium Mineralization in Remaja Sector, Kalan Area, West Kalimantan

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ABSTRACT

Manual ore body modeling on Remaja Sector, Kalan, West Kalimantan generally takes a long time and is subjective. On the other hand, automatic modeling (implicit modeling) is faster, objective, and equipped with uncertainty factors. This study aimed to analyze the comparison between the geostatistical Sequential Indicator Simulation (SIS) ore body model to the manual ore body model. The lithology database was used as input for variogram analysis and SIS simulation. The directional variogram was used to construct an experimental variogram for the lithology with orientation data. The orientation of the lithologies corresponds to the anisotropy of their variogram map. The SIS was carried out in Block A and Block B with block sizes of 6×6×6 m^3 and 5×5×5 m^3 respectively. The simulation results were processed to produce a lithology probability model. By using maximum probability as block lithology, simulation results were well validated by the composite database histogram, the lithologies along the tunnel on the geological map of level 450 masl of Eko Remaja Tunnel., and the lithologies along boreholes. The weakness of the geostatistical ore body model was the results depending on the input parameters. Meanwhile, several advantages of the geostatistical ore body model were a faster processing process, equipped with an uncertainty factor, and the block size of the model has taken into account the distance between grade data so that it can be used directly for grade estimation. Quantitatively, the geostatistical ore body model had a higher average percentage of conformity to the lithology of the mineralized zone along the borehole than the manual ore body model.

Keywords: Kalan, geological modeling, geostatistics, sequential indicator simulation, uranium

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MANUSCRIPT WRITING GUIDELINES

The articles published in this journal are hthe results of studies, research, and development of nuclear geology with the scope of geology, exploration, mining, processing of nuclear minerals, and environmental safety as well as the development of nuclear technology for people's welfare. The articles are original work and have never been published.

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    [2] F. Ferrari, T. Apuani, and G.P. Giani, "Rock Mass Rating Spatial Estimation by Geostatistical Analysis", *Int. J. Rock Mec. Min. Sci,* vol. 70, p. 162-176, 2014.
    [3] L. Blevin, "Metallogeny of Granitic Rocks", *The Ishihara Symposium: Granites and Associated Metallogenesis*, Geoscience Australia, p. 1-4, 2004.
    [4] H. Syaeful, Suharji, and A. Sumaryanto, "Pemodelan Geologi dan Estimasi Kalan, Kalimantan Barat", *Prosiding Seminar Nasional Teknologi Energi Nuklir*, Pontianak, 2014.

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