Preliminary investigation on plastic clay deposit in Langkap Perak, Malaysia and its potential use for ceramic industry

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Abstract

This study describes the sedimentary clay (plastic clay) deposits in Langkap Perak, Malaysia, an area overlying major parts of the coastal plain of western Malaysia. It also presents the potential use of plastic clay as a raw material for the ceramic industry.

Geophysical resistivity imaging and delineation survey indicate that the Langkap area is overlain with stiff, unconsolidated fluvial sedimentation (flood plain) plastic clay sequence that is 0.5- to 7m deep. This clay layer is also underlain by a thick sequence of discontinuous horizon of sandy-sandy gravel rich clay of paleo-stream channel fill and lenses of 7 to 20 metersand subsequently by the more consolidated clay horizon, probably an older fluvial clay unit, beyond 20 meters. Physicochemical and mineralogical analyses of selected crude clay samples from two auger holes at depths of 1-5 meters show that the slightly yellowish to brownish grey clay generally, possesses moderately good workability and plasticity values. This property could be due to excessive silica and organic matter content However, overall size fractions at D90 are less than 2µm. Crude clay is dominantly composed of minerals namely, kaolinite, quartz minor fine sericitic mica (illite) and chlorite. It is typically rich with silica (62%), alumina (32%) with low levels of iron (1.70%), potash (2.00%), magnesia (0.75%) and titania (1.00%) with LOI about 13%. The clay shows a good firing behaviour with low linear shrinkage and moderate Modulus of Rapture (MOR) (flexural strength) values and a creamy white, smooth body. In view of these characteristics, plastic clay is of potential use for ceramic industry.
Occurrences of skarn mineralization in deep drill holes at Batu Hijau Porphyry Copper-Gold Deposit, Sumbawa Island, Indonesia

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Abstract

The Batu Hijau deposit located at the western corner of Sumbawa Island in the Sunda-Banda archipelago of Indonesia is a world class porphyry copper-gold deposit. The mineable ore reserve of the deposit is 914 million metric tones with the grade of 0.53\% copper and 0.4g/t gold (4.84 million tones copper and 375 tonnes gold). Moreover, the drilling project of Newmont, 2003 was conducted in this deposit and the skarn mineralizing layers were found by this drilling project at the surrounding of this porphyry which is closely related with the tonalite porphyry intrusion (early- to mid-Pliocene). According to present field observations, the skarn mineralization occurs as the intercalated layers or alternated layers with the layers of calc-silicate rocks, in varying thickness and mineralogy. The most calc-silicate minerals are garnet, clinopyroxene, zeolite, and epidote that are found as the most common minerals. The predominant skarn mineralization includes chalcopyrite, pyrite, magnetite, gold and other sulphide minerals. The skarn ore mineralization is closely related with massive magnetite and disseminated pyrite and chalcopyrite. The copper-gold content is especially rich in brecciated and broken magnetite zone. The presence of garnet and clinopyroxene indicates the prograde stage of skarn mineralization and that of zeolite, epidote, calcite and quartz points out the retrograde stage. The structural relation relationship and the nature of the contact observed from the field point to the formation of skarn mineralization and calc-silicate rocks corresponding to porphyritic tonalite. Consequently, it can be assumed that the calc-silicate rocks and skarn mineralization may be derived from the andesitic volcanic unit and the type of skarn may be classified as endoskarn.
The Tertiary volcanic rock distribution in Yogyakarta and vicinity, Indonesia

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Abstract

The formations from different volcanic sources in Yogyakarta and its vicinity have been mapped as a single formation (such as Old Adesite Formation). These formations have caused problems in determining the stratigraphic relationship between the volcanic deposits and other deposits surrounding the ancient volcano.

This research investigates the existence of Tertiary volcanic rocks by using Landsat TM, and gravity anomaly map. The samples of each group of volcanic rocks are identified based on major element’s properties from the results of XRF measurements.

At least nine groups, namely, Ijo, Gajah, Menoreh, Godean, Bayat, Parangtritis, Ngalang, Sudimoro and Godean, are identified in this research. Based on petrochemical properties, all of the volcanic rock groups consist of basalt-andesite except some samples from Sudimoro which are dacite. This research also created a new stratigraphic column of the West Progo Mountain region based on the paleontological data and field observation.
Synthesis and characterization of Philippine halloysite nanoclay filled epoxy molding compound for Integrated Circuit Packaging

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Abstract

Package encapsulation of an integrated circuit (IC) is one of the major processes in manufacturing a semiconductor device. It protects the IC and all the different parts of a package from harsh environment. Epoxy molding compounds (EMCs) are used for integrated circuit (IC) packaging and one of the major components of EMC is the filler. The objective of this study is to develop an epoxy molding compound using Philippine halloysite nanoclay as filler to improve the thermal properties of IC packages. The effect of varying clay loading on the EMC was determined using differential scanning calorimetry (DSC), thermogravimetric analysis (TGA) and moisture absorption test based on the JEDEC Standard for microelectronic devices. The morphology and dispersion of halloysite in the epoxy system was observed using the scanning electron microscope (SEM), atomic force microscope (AFM), and x-ray diffraction (XRD). Results showed that moisture absorption decreases with increasing halloysite content. The Epoxy-halloysite nanocomposites conformed to the molding specification of >150°C glass transition, and ≥ 300°C decomposition temperature. The local halloysite can be used as filler in EMCS to decrease moisture absorption, has high crack resistance with low glass transition temperature, and conforms to operating temperature of the IC package with high decomposition temperature.
Mineral resources for cement manufacturing in Dorng Tong District of Kampot Province of Cambodia

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Abstract

The mineral resources in Cambodia are numerous, with several minerals having been discovered. These minerals have been a major contributor to the country’s economic, social, and industrial development. Kampot is a province of Cambodia, located 130 km south of Phnom Penh. The province is endowed with principal resources like limestone and phosphate. Limestone and clay are major components in cement manufacturing. Our research is concerned with the mineral resources in Dorng Tong District of Tatung mountain which are used in a cement plant (Kampot Cement Co., Ltd.). This paper will present the process of cement manufacturing using the minerals in the area. The cement manufacturing process involves four principal steps: raw material preparation, burning process, cement grinding and packing. The consumption of limestone is approximately 1.2 M.ton/year, with capacity of production of 2500T/day Clinker.
Abstract

In it is important to consider the potential of plants in the remediation or rehabilitation of areas affected by mining as well as their capability of absorbing metals in anomalous amounts which could be an alternative to traditional mining. This is one innovative way of addressing the environmental impacts of mining. Studies on metallophytes have identified some plant species that thrive on nickeliferous laterites and on cupriferous soils. It has been a concern as to how these plants accumulate the heavy metals the soil contains, and specifically how much of the available metals are being taken up by these plants. In nickeliferous laterites, some of the identified plants were Sapotaceae planchonella, Apocynaceae alstonia macropylla and Cunoniaceae weinmannia sp. Results show similar responses between Sapotaceae planchonella and Apocynaceae alstonia macropylla in terms of total iron content in their leaves, stems and roots. Cunoniaceae weinmannia sp. exhibited the highest response. In cupriferous soils, some selected native ferns were studied and identified species that are tolerable to Cu (and As) enriched soils. Five native ferns species, Pteridium aquilinum, Dicranopteris linearis, Pityrogramma calomelanos, Pteris sp., Nephrolepis hirsutula were sampled and analyzed for Cu using the root-stem-leaf components. Nephrolepis hirsutala and Pteris sp. were identified to be the best Cu-tolerant species. The results indicated the existence of specific plants that can tolerate and abnormally absorb high concentrations of metals from the soil thus could be used for phytomining.
A GIS System for assessment of volcanic hazards

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Abstract

Geographical Information System (GIS) capabilities that correlate various sources of the data with its geospatial data, used programming the terrain and image analysis procedures, integrated data and inferred knowledge from integrated data, have the merits that will be used for the development of the digital data of volcano and analyzed the process and the effect from volcanic hazards. Structured data can be used for analyzing the volcanic hazards based on querying and mining of the map, image, and temporal data as the data input. The principles of this research are developing the volcanic hazards information system that capable modeling and covering the condition and activity the volcano, so the susceptibility, hazard and risk zoning of volcanic hazards can be estimated.
Geological study of the Yadanatheingi Lead-Silver Mine in Naungcho Township Northern Shan State, Myanmar

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Abstract

A comprehensive study of Yadanatheingi lead-silver mine was conducted based on regional geology, mining exploration, chemical assaying, mining and milling. Two types of mineralization were observed at the Yadanatheingi mine: 1) disseminated type with 3-4% content of Pb and; 2) massive replacement type with a well of over 20% Pb. Mineralization is confined to a certain horizon of successive layers of metasediments of the Chaung Magyi Group with barite predominantly in the upper horizon and sulfide and quartz in the bottom layer.

The Yadanatheingi ore mine bodies are strata bound and are formed from the remobilization of metals during epimetamorphism. The most significant feature of the Yadanatheingi mine ore is their high silver content. It has been estimated that there is one ounce of silver for every one percent of lead in the ore. The square set stoping method was exclusively used in this mine because of the brecciated, faulted and fractured nature of the country rocks. The production is estimated at approximately 0.65-0.70 tons per man-shift. At present, the mine produces over 7000 tons of ore per annum.

Most of the ore from the Yadanatheingi mine are sulfides with some oxidized ore. Therefore, the flotation method is the most appropriate for ore beneficiation. Mill recovery is calculated at 60 percent. With the current annual ore production of 7600 tons, the gross value of the Yadanatheingi mine ore reserves is $2.1 million and the mine life is 14 years. Since its discovery 30 years ago, ore is still present within the area.
Rare earth elements resource potential in weathered crusts of granitic rocks in Southeast Asian Tin Belt

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Abstract

Geochemical and mineralogical studies were conducted on the granitic rocks and their weathered crusts in the Southeast Asian Tin Belt in order to investigate the potential of ion-absorption type REE (rare earth elements) resource. The studied areas include Chain Rai and Chiang Mai-Tak in northern Thailand, Ranong, Takua Pa and Phuket tin-fields in the Western Belt in southern Thailand, and Bangka Island (Tin Islands) in Indonesia. Granitic rocks and their weathered crust in the Western Belt of southern Thailand and some of those in northern Thailand show relatively high REE contents, whereas REE contents of granitic rocks and their weathered crust in Bangka island are low. Total REE contents of weathered crust of granitoids in Western Belt in southern Thailand reach 1000ppm. HREE contents in greisen and hydrothermally argillized granitic rocks and kaolinite veinlets associated with tin deposits in southern Thailand are high, and thus, they show relatively flat chondrite-normalized REE pattern. The Western Belt in southern Thailand associated with tin deposits has a potential for the REE resources in hydrothermally argillized granitic rocks and kaolinite veinlets associated with tin deposits. On the contrary, REE contents of granitic rocks and their weathered crust in Bangka island are lower than those of the original fresh granitic rocks in general, and chondrite-normalized REE pattern of the weathered crust of the granitic rocks show LREE depletion from the original granitic rocks. In general, weathered crust is poorly developed and fresh granitic rocks crop out by erosion in Bangka island. The granitic rocks and their weathered crust in Bangka island probably have a low potential of REE resource because of removal of weathered crust by erosion and depletion of REE by leaching from
the weathered crust of the granitic rocks.
A calculating and simulating program for the process of fracture propagation in hydraulic fracturing

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Abstract

In hydraulic fracturing method, an understanding of the fracture propagation is very important for the improvement of damaged zones near wellbore. However, due to formation complexities, calculating induced fracture’s geometries is not easy in most cases. The fracture calculating and simulating techniques often concentrate on the fracture length and width, with the accepted hypothesis being the constant fracture height.

The paper will introduce a “Hydraulic Fracturing Stimulation – HFS” program written in Matlab language. This program has been applied to two well-known models used worldwide, namely the GDK model (Geertsma, DeKlerk, Khristianovich & Zheltov) and the PKN model (Perkins, Kern, Nordgren). Numerical results obtained from this program were displayed and compared with other theoretical and experiential ones from the hydraulic fracturing process. They showed the confidence, accuracy of this program as well as its effectiveness, potential for the fracture calculating and simulating in the hydraulic fracturing design and treatment process.
Effects of sedimentary ground with irregular interface on buried pipeline during an earthquake

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Abstract

Medium pressure gas pipelines sustained severe buckling damage during the 2007 Niigata-ken Chuetsu earthquake. We investigated the relationship between damage to the gas pipeline and the ground with irregular interface at Kashiwazaki city in Niigata prefecture. Axial strain of the ground have a great influence on pipelines, therefore, we calculated the ground strain parallel to the pipeline by using Aki-Larner Method, which can solve the ground response for arbitrary input ground motion. The ground strain obtained is in good agreement with the value of experimental data at which the buckling begins to occur.
Rock salt production in northeastern Thailand

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Abstract

Every day, every one of planet earth's 6 billion inhabitants uses salt. We need a small amount of salt to survive. Over the past century the annual production of salt worldwide has increased from 10 million tonnes to over 200 million tonnes today. Salts can be separated mainly into 2 types, namely, sea salt and rock salt according to their origin.

A huge amount of rock salt has been found underneath the northeastern region of Thailand. Salt has been produced from brine in this region for several decades. Thailand is the major exporter of rock salt in Southeast Asia.

This paper will present a study of rock salt underneath northeastern Thailand. Various methods to produce rock salt are extensively demonstrated along with the effect of rock salt production. Solution mining has been proposed to improve efficiency of rock salt production from northeastern Thailand.
Notes on the gold mineralization in the Vista Alegre-Bulawan Ridge, Negros Occidental

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Abstract

A 6.5 kilometer long by 1.5 kilometer wide, NE-SW trending highly mineralized terrain was recognized in Vista Alegre-Bulawan Ridge in Hinobaan, Negros Oriental. The mineralization is marked by the presence of the former Bulawan Gold Mine in the NE and by the recently delineated Nagtalay Gold Deposit in the SW with several prospects in-between. The ridge is perpendicular to the postulated NW-SE trending porphyry copper belt of SW Negros. Underlying it is a basement of andesite intruded by dacites with small diorite bodies mapped as xenoliths. Xenoliths are of several varieties: dacite porphyry, dacite porphyry breccia, rhyodacite porphyry and rhyodacite breccia. In many instances, the contact between the andesite and the dacite porphyry intrusions can be marked by multilithic breccias which are composed of andesite, quartz diorite and dacite porphyry fragments in a dacitic groundmass. Two general types of gold mineralization are recognized: (1) as high-temperature disseminations associated with sulphides and as gold telluride in the dacites as exemplified by the Nagtalay and Bulawan deposits; and (2) as low-temperature (epithermal) low-sulfidation veins in the andesite and dacites as found in the Laka Quartz and Libertad areas. Sericite-calcite alteration assemblage accompanies the high-temperature gold mineralization while narrow argillic selvages mark the epithermal gold deposits. The highest gold assay recorded is 27 ppm Au in Nagtalay and 160 Au in Laka, Quartz. The veins and the Nagtalay disseminated deposit possess a strong NE trend. Preliminary interpretation indicates that the progenitor dacitic rocks have been emplaced along pre-existing NE-trending structures. It is apparent that gold deposition was episodic along these structures, yielding deposits with divergent temperatures of formation that are now spatially juxtaposed.
An evaluation of ground motion characteristics in Southern Yogyakarta Basin, Indonesia using 1D equivalent linear analysis

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Abstract

The fundamental frequency and spectral ratio between horizontal and vertical components (H/V Ratio) of microtremor measurements were used to estimate S-wave velocity structures in 508 sites of the Yogyakarta Basin. The wave form of Kamo Earthquake, 2004 (M 6.3, max. acc. 232 gal) was used as bedrock input earthquake motion for equivalent linear analysis. 1-D seismic response analysis was performed by using equivalent linear analysis based on S-wave velocity structure, thickness and engineering properties of each soil layer and selected earthquake motion. The amplification ratio, Fourier response spectra, acceleration response spectra and time-history at each site were determined. Amplification ranges from three to five, with the highest amplification observed in Bantul, Pandak, Imogiri, Bambang Lipuro, Pleret and Kasihan areas. Response accelerations were calculated for three different damping ratios, 2%, 5% and 10%, and are relatively bit high in central porting of the basin. The effect of nonlinearity is well observed in spectral ratio and response spectra.
Quality and underground water treatment charged of iron and manganese in Prey Romdeng Commune

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Abstract

The underground water contains commonly little suspension matters and organic matters. In addition, it has a low value of turbidity. The chemical substances found in underground water include Nitrite, Arsenic, Manganese and Iron, etc. which, when present in large amounts could pose dangers to the health. In the Prey Romdeng commune, chemical analyses of some underground water indicate a concentration of Iron and Manganese which is higher than Drinking Water Quality Standards. It is thus urgent and necessary to find a good solution to reduce or eliminate these hazardous matters. The objective of this research is to study water quality in the villages and to analyze the quality of treated water that flows from or are dispensed by the groundwater treatment station in Dei Kraham village.
Applying Geographic Information System (GIS) in identifying and selecting suitable geologic disposal sites for radioactive waste

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Abstract

Radioactive waste is generated from the production of nuclear energy and from the use of radioactive materials in industrial applications, research and medicine. The importance of safe management of radioactive waste for the protection of human health and the environment has long been recognized and considerable experience has been gained in this field. In Vietnam, the disposal of radioactive wastes from nuclear power generation in an underground facility is considered the appropriate long term solution for nuclear waste management. It is crucial to evaluate the characteristics of a set of potential sites for building facilities to safely store or dispose high-level nuclear waste. This paper presents a geographic information system (GIS) based hierarchical approach for site suitability assessment in Vietnam. A large volume of multi-source data including those describing hydrogeologic, geologic, and environmental characteristics are pre-processed, stored and analyzed in a geospatial database. Potential sites for nuclear waste disposal are characterized and evaluated utilizing a suitability index based on selected factors and constraints, including land use, ground slope, geology, distance to water bodies, distance to major roads, distance to town centers, and parcel size. This paper provides examples of the application of this approach to identifying regions likely to contain sites that are suitable for radioactive waste disposal.
Swedish Weight Sounding Test (SWST)

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Abstract

In this paper, the authors describe the use of the Swedish weight sounding test for purposes of estimating bearing capacity and settlement of low rise structures founded on shallow foundations, as well as the estimation of shear strength for purposes of evaluating the stability of slopes susceptible to shallow slides. Case studies involving the use of the Swedish weight sounding test for purpose of geohazard risk assessment in the provinces of Ifugao and Kalinga-Apayao are presented.
Segmentation-based georadar 3D modelling and 3D laser scanning for geo-engineering

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Abstract

Georadar surveys were conducted to detect rock mass discontinuities not exposed for surface measurements using 3D Terrestrial Laser Scanning (3D TLS) and other conventional field methods. It is worth noting that radargram interpretation is subjective, as it is based primarily on one’s ability to recognize patterns in a georadar image. To delineate objectively the discontinuities in the georadar image, a semi-quantitative segmentation-based, automatic delineation of linear coherent events was carried out. This was integrated with the georadar 3D modelling, to significantly improve the determination and correlation of several linear reflection events. The integration of segmentation-based georadar modeling and 3D TLS yielded a better characterization of the rock mass discontinuity properties, an input vital to various geo-engineering works.
An evaluation of the stability of stope access to Ciurug Tunnel on Pongkor Gold-Silver Mine, West Java, Indonesia

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Abstract

The instability of rock mass in the tunnel poses a threat to the safety of men and equipment in the mine. Profitability of mining operation may be reduced due to rock falls in the stope. Access becomes a problem like what occurs in the block “II-south” from x-cut 9 to 11 in level 500 of Ciurug tunnel in Pongkor, an underground mining for gold-silver deposit in the northern flank of the Bayah Dome, 80 km southwest of Jakarta. This Bayah Dome is part of the Neogence Sunda-Banda continental arc that developed along the southern margin of the Eurasian plate from the Northward subduction of Indian-Australia plate.

This study aims to analyze the stability of the rock mass by applying the rock mass classification RMR and Q-system. Empirical calculation was done to indicate the total amounts of rock bolt, wire mesh, and shotcrete quality that need to be installed as simulated in deformation of pre- and post- installed as shown in 2D elastic model. It also aims to find the relationship between RMR and clay mineral contents in the rock mass. The percentage of clay mineral content in the rock sample was analyzed using XRD analysis based on the fact that there are some groundwater seepage, weathered rock and weak mineral contents in the discontinuities of the rock mass.

The results from RMR show that the quality of the rock mass in the study area is mostly fair to good rock which provides the type of protection against rock mass deformation as shown in the 2D model. Finally, the research shows that the amount of clay mineral in the rock mass is directly correlated to the stability of the rock mass.
Chromium transport from Piyungan Landfill, Yogyakarta, Central Java, Indonesia

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Abstract

The groundwater contaminant transport is an important thing to sustain of groundwater resource and reduce the risk of groundwater. Further, these are useful for groundwater-resource management and policy. Piyungan Landfill has been operated since 1985 and is the biggest landfill in Bantul Regency. Day by day the wastes are increasing in Yogyakarta is dumped in Piyungan landfill that can produce leachates which give value of contaminant concentration. According to, the primary result of water quality samplings which measure from leachate to dug well and to river. The result of Cr total resulting was higher than 0.05 mg/l which outcome was among 0.2164 to 0.3885 mg/l. Base on, the water quality resulting which mentioned on upper part, the hypothesis is contaminant are moving from leachate pond, thus this research will focus on the contaminant transport map and plum map, to understand the nature of contaminant plume from Piyungan landfill. The expectation of outcome is the contaminant plum map and modeling. In order to circumvent, minimize, or mitigate the contaminants in groundwater and the river, the result will be used to carry groundwater management by the community and different government agencies.
Hydrothermal alteration associated with epithermal gold mineralization at Dalangturu and Suruh Prospects in Trenggalek Regency, East Java Island, Indonesia

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Abstract

Dalangturu and Suruh prospect areas are located in Trenggalek Regency in East Java, Indonesia. Report of high potential for epithermal gold deposit at the prospect areas indicate vein float assaying gold up to 12 g/t at Dalangturu and 10 g/t at Suruh respectively. Both prospects contain extensive areas (2x3 km²) of replacement silicification and hydrothermal breccias associated with anomalous pathfinder metal (As, Sb, Hg) contents. The purposes of this research are to understand the nature of the paleo-hydrothermal activity and to provide guidelines for further exploration, detailed geological background, surface hydrothermal alterations and associated mineralization. Geological mapping, sampling and alteration zone mapping were carried out to define the geology, alteration and related mineralization. The rock type that defines the geology of the research area includes andesite lava, volcanic sandstone, tuff, silicified hydrothermal breccias, limestone, colluviums and alluvium deposits. Petrological and geochemical evidences indicate that the protolith of the gold and base metals mineralization occurs in narrow, colloform-crustiform banded quartz-chalcedony veins hosted by andesite flows-breccias and tuff. With the support of petrology, whole rock geochemistry and XRD analyses it is inferred that the protolith is the center of hydrothermal activity with four hydrothermal alteration zones. The zones are cristobalite-smectite-kaolinite zone (zone I), quartz-smectite-kaolinite zone (zone II), mix-clay zone (zone III) and quartz-adularia-kaolinite zone (zone IV). The sensitive clay minerals indicate that these alteration zones are formed under temperature 100-280°C. Mineralization occurred in the late stage of hydrothermal activity as veins and commonly characterized by the presence of quartz veins with variable amount of base
metals. The results of this research support the presence of shallowly preserved, low-sulfidation epithermal mineralization systems and the potential for significant gold mineralization at greater depth in both prospect areas.
Arsenic occurrence in groundwater of Kandal Province, Cambodia

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Abstract

Cambodia is known as one of the world’s countries affected by significantly high concentration of arsenic in groundwater. On-site measurements and lab analyses by ICP-AES and IC on groundwater from three villages of Kandal Province, Cambodia (namely Chong Prek, Prek Tameng, and Prek Thom) were conducted. The results showed that arsenic occurrence was in elevated levels in groundwater (up to 1.42 mg/L), especially in Prek Thom village. Iron was also determined. Nearly all the twenty-five samples contained arsenic and iron concentrations exceeding the WHO drinking water guidelines (over 10 µg/L for As and over 300 µg/L for Fe) and the Cambodian legal limits of drinking water (over 50 µg/L for As and over 1000 µg/L for Fe). Moreover, available data of groundwater were used trying to speculate the possible sources and mobilization of arsenic in the Kandal Province, Cambodia. As a result, it was suggested that arsenic was once sorbed onto the sediment and then released into the groundwater by dissolution of iron oxides in the reducing condition or probably associated with pyrite. Thus, the occurrence of arsenic in Kandal Province poses a health threat to the villagers in Kandal Province and appropriate treatment of groundwater must be implemented.
Phenol contamination of groundwater in Yogyakarta, Indonesia: A case study

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Abstract

Madukismo sugar/alcohol factory is well-known for being a hot-spot location of phenol groundwater contamination in Yogyakarta City, Indonesia. The cause of contamination has been traced to the untreated waste water that flows from the factory – the factory’s wastewater treatment plant had not functioned for many years. The wastewater that contains a high concentration of phenol from the sugar alcohol processing discharges directly to the environment. Phenol intake could result in various acute and chronic effects on human health; hence, it is crucial to undertake the hydrogeological study of phenol contamination to better understand phenol movement as well as to characterize its plume dimension and its associated concentration in the aquifer. The results of the study has show that phenol has leaked to the shallow groundwater and polluted many supply wells inside the village at the down gradient of Madukismo factory. It was observed, likewise, that phenol has already moved to a distance about 600 meters from the source and its concentration has somewhat reached 1 mg/L. These facts relate to the groundwater system (aquifer characteristics) and the long period release of the contaminant.
Earth engineering technology learned from low temperature serpentinization

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Abstract

Serpentinization has been clearly recognized as an important geo-physical and chemical process in mantle wedge and oceanic lithosphere.

Serpentinized peridotite generally forms at reaction temperatures of 100–500°C as indicated by chemical, mineralogical and isotopic data. On the other hand, temperatures of present-day serpentinization observed at Lost City vent fluids are considerably lower (40–75°C). This is in strong contrast to other known serpentinization systems.

Thus, the temperature variability expressed by vent fluids from ultramafic-hosted hydrothermal systems on or slightly removed from mid-ocean ridge is not altogether surprising. The low temperature hydrothermal field is characterized by a combination of extreme conditions never before seen in the marine environment. These conditions include venting of hyperalkaline, metal-poor hydrothermal fluids with high concentrations of dissolved H₂, CH₄.

The extensive use of alkaline materials such as cement, slag and fly ash is envisaged in geological repositories of waste for encapsulation, backfilling, and grouting purposes. However, degradation of the above alkaline materials in the repositories can produce a high pore fluid pH initially ranging from a pH of above 12. However, an understanding of the processes at extreme hyperalkaline condition is not enough for safety assessment of waste disposals. In addition, many engineering chemists and biologists are also interested in the hyperalkaline processes for safe CO₂ geological storage, application of Fisher-Tropsch type reaction to natural system, metabolic mechanism of fishes living in hyperalkaline spring and so on. Therefore, there are many lessons that can be learned from low temperature present-day serpentinization.

In this context, previous studies on low temperature present-day serpentinization will be reviewed in this presentation from the engineering points of view, with introduction of our studies at Oman ophiolite.
Weathering induced on slope instability in Laos: Case study along the Road No.13 North (Kasi – Phoukhou Un District) Vientiane and Luangprabang Province

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Abstract

The research work is conducted in Laos, along the roads No.13 North (Kasi – Phoukhoun District) Vientiane and Luangprabang Province. The main objective of this research is to conduct experiments and investigate the effects of weathering processes on the characteristics of some weak rocks and soils. Primarily, the effort involves simulation of the weathering-induced degradation of rock and soil specimens and determination of the development of the rocks and soils at various stages of degradation, towards establishing the parameters for measuring weathering-related variables that affect rock and soil degradation. The study makes use of X-Ray Diffraction (XRD) and X-Ray Fluorescence (XRF) methods for analyses. Twelve soil and three rock samples are subjected to XRD while XRF is used on samples of twelve soil types taken from the research sites in Laos. In an attempt at correlating the rock & soil with mineral compositions, a concept is proposed to describe the rock & soil degradation characteristics under the XRD & XRF analyses methods. The results of this study will then be interpreted to ascertain the mineral type and chemical composition that induce the weathering of parent material, soil and bedrock. The study allows for prediction of the rock & soil types affected by weathering. Further, results indicate that clay mineral group such as smectite, kaolinite, halloysite & choholite and quartz which are affected to a large degree by weathering, primarily due to density of water content in soil are easily degraded by cyclic changes in atmospheric temperatures and through time. Moreover, these data will help expand information needed, especially, for further studies and investigations on factors that trigger weathering occurrences and on related chemical and physical reactions which induce slope instability in the geographic area covered by the research. Hence, this research is very important in helping find solutions to problems caused by weathering. It will be helpful, likewise, in identifying areas likely to show slope instability.
Electrical resistivity method – Some applications in engineering and environmental work

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Abstract

Electrical resistivity method has been used widely in environmental and engineering site investigation. However, the interpretation of the subsurface resistivity distribution requires prior information. Two cases will be presented where prior information has helped improved knowledge of true subsurface conditions and has aided in the application of appropriate mitigation measures.
Application of PFC$^{3D}$ for slope movement on colluvial soil

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Abstract

In the mountainous area of the tropics, soil creep often occurs on residual soil and colluvial deposit. The rate of occurrence of this phenomenon varies from very slow to extremely slow and is difficult to detect without equipment and model. Within PFC$^{3D}$ (Particle Flow Code in three dimensions) granular materials such as soils are simulated by balls. The PFC$^{3D}$ model was applied to colluvial soil creep. Although limited to some extent, this application has proved useful in determining direction of creeping as well as zone of creeping of colluvial soil.
Landslide triggering factor in a hydro-thermally altered area. Case study: Kasihan district, Pacitan regency, East Java, Indonesia

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Abstract

Landslide is a common earth disaster which happens occasionally in mineralized areas, such as in Kasihan district, Pacitan regency, East Java, Indonesia. The Kasihan district consists of 3 main alteration types, i.e., propylitic, argillic, and calc-silicate alteration. The high degree of alteration overprinted by weathering in this area produces large amount of clay minerals, especially smectite. The presence of smectite in the argillic alteration zone might have triggered landslides in the area. The results drawn from this research project, in fact, indicate that clay minerals, especially smectite, formed by hydrothermal alteration is the primary cause of landslides in mining areas. The relationship between total composition of smectite around sliding plane, swelling capacity of this mineral (swelling potential index), and accumulated rainfall are the important parameters to consider in predicting landslides.
Thermo-tectonic history of Cretaceous granite in North Kyushu, Japan using apatite fission track chronology

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Abstract

Apatite fission track thermochronology is an effective tool for determining the cooling and uplifting histories of rocks in the shallow crust. Quantitative models for the time and temperature dependence of the fission track annealing process in apatite have been clarified by many researchers. Therefore, the combination of fission track apparent age and track length distribution is well-understood, and may provide the thermal history of the samples from 120 to 60 degree C (partial annealing zone).

In order to reconstruct the thermo-tectonic history of Cretaceous granite in North Kyushu, Japan, apatite fission track thermochronology was applied in a suite of twenty-seven apatite samples collected from outcrops with a low elevation. The study area mainly consists of Cretaceous granitic rocks and Tertiary/Quaternary sediments.

Apatite grains separated from granitic rocks were analyzed using the external detector method. The apatite samples were etched for 40-60 sec in 7% HNO₃ at room temperature. Thermal neutron irradiation was carried out at the IRR-4 reactor in the Japan Atomic Energy Research Institute. Ages were determined using the Zeta calibration method. The full length of confined fission tracks revealed tracks-in-tracks in apatite. ²⁵²Cf spontaneous fission fragments irradiation was applied to increase the number of confined fission tracks.

The fission track cooling ages vary from 10 to 70 Ma. The confined fission track lengths vary between 10.8 and 14.4 micro meters. The study area was divided into three geologic blocks such as the east, central and west blocks based on the age data. Apatite samples from the east block indicated age of around 60-70 Ma and shortened track length distribution. Those of the central block show ages of around 15 Ma and most fission tracks were not shortened. Whereas those of west block indicate 20-40 Ma and some of track length distribution were bimodal. Based on fission track thermal history modeling of the age and full track length data, cooling histories of the three geologic
blocks indicated different paths. The reason of such different cooling paths were interpreted to be dependent on the following uplifting history; (1) In the east block, the present surface rocks of granite experienced uplift to the near surface around 50-60 Ma and subsided down to the partial annealing zone during 35-50 Ma, then uplifted again around 15-20 Ma. (2) In the central block, the present surface rocks were near the surface around 50 Ma, then subsided down to the complete annealing zone (higher than 120 degree C), following by uplift at around 15-20 Ma. (3) In the west block, the present surface rocks gradually uplifted and experienced passage of the partial annealing zone during 10-50 Ma. Although major border faults between each blocks were not detected, different uplifting histories of each geologic blocks were clarified by apatite fission track thermo-chronology.
Secondary oxide minerals of Bawdwin ores

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Abstract

The galena and sphalerite are the most important primary ores with silver being closely associated with the galena. With the fast depleting primary sulphide ores and to sustain the production level, it has become crucial to develop and mine the oxide ores by open pit mining methods. The supergene processes occur above the underground water table which lies at a depth of about 100 feet from the surface. The oxidation and supergene processes change the exposed primary sulphide ores into hydrated or non-hydrated sulphates, carbonates, supergene sulphide and native ores. The secondary oxide minerals such as anglesite, cerussite, mimetite, chalcocite, azurite, malachite, covellite, and nickel bloom can be observed in the open pit. By the field study, there are no evidences of the secondary enrichment in the Bawdwin deposit.
Progress of environmentally conscious hardened materials using geopolymer formation technique

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Abstract

The geopolymer formation technique is introduced from the viewpoints of carbon dioxide gas reduction in the atmosphere and utilization of the unused silicate resources and waste. A hardened geopolymer body exhibits ion exchange capability and shows strong ion exchange selectivity, especially for heavy metals such as lead. It was also possible to make hardened molding bodies having the higher strength and porosity which include higher crystalline zeolites and/or clay minerals more than 80 wt% using the geopolymer binder. By the room temperature molding method, a plastered wall and a building material with the adsorptive efficiency of the harmful ion can be produced. The new high-functional hardening body production technique harmonized in the global environment could take a place by the cement now.
Landslide risk mapping using GIS-based weighted linear combination in Kulon Progo Regency, Yogyakarta Special Province, Indonesia

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Abstract

To produce a landslide risk map, landslide susceptibility and vulnerability maps are needed. In this study, landslide susceptibility map was developed based on six parameters such as slope inclination, lithology, relative relief, distance to faults, distance to streams, and rainfall. Supported by GIS software, scores given to each class of parameters were done according to landslide density - a ratio between the area occupied by the landslide pixels on a class of a certain parameter and the total area of that class, and then expressed in percentage. Meanwhile, weights for all parameters were determined by using opinion-based scores adopting a criterion of analytical hierarchy process (AHP). For vulnerability mapping, two important parameters such as land use and infrastructures were analyzed. Scores and weights were given to each class of both parameters by using expert-based opinion. As a result, landslide susceptibility map gives a very reliable result because it has a close relationship with the real situation in the field. Moreover, five levels of risk zones were mapped and it was illustrated that the settlement and its junction with important infrastructures which are located in areas of moderate to very high susceptibility, are at very high risk to landslides.