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# MINERALS ENGINEERING

## - A Global Alert Service

**Issue No. 78, July 2008**

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**Issue No. 78, July 2008**

## Experimental study on performance of a continuous centrifugal concentrator in reconcentrating fine hematite

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INTERNATIONAL JOURNAL OF MINERAL PROCESSING, [ELSEVIER SCIENCE BV, AMSTERDAM], Apr, 2008, Vol. 87, pp. 9-16.

A pilot continuous centrifugal concentrator was used to reconcentrate fine hematite from a high gradient magnetic separation concentrate to study the effect of feed volume flow rate, feed % solids, drum rotation speed, drum inclination and reciprocating velocity of high pressure water sprays on concentrate upgrade ratio, iron recovery and separation efficiency. The results of this investigation indicate that the changes in reciprocating velocity of high pressure water sprays and drum rotation speed have the most significant influence on the performance of the concentrator; a too low or too high feed volume flow rate deteriorates the separation performance; the increase in feed % solids deteriorates upgrade ratio but increases recovery; the optimum values of feed volume flow rate, feed % solids, drum rotation speed and reciprocating velocity of high pressure water sprays are all related to the drum inclination and the change in the inclination of drum from 3 degrees to 5 degrees causes a rise in upgrade ratio and a drop in recovery. When all the variables were kept optimum, a concentrate assaying 62.32% Fe with 65.02% recovery can be achieved at a drum inclination of 5 degrees. It was concluded that this kind of concentrator is efficient in reconcentrating fine hematite from a high gradient magnetic separation concentrate. 
DOI: 10.1016/j.minpro.2008.01.002

## Flotation of indium-beard marmatite from multi-metallic ore

Tong, X; Song, SX; He, J; Lopez-Valdivieso, A
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RARE METALS, [NONFERROUS METALS SOC CHINA, BEIJING], APR, 2008, Vol. 27(2), pp. 107-111.

Flotation of indium-beard marmatite from Dulong multi-metallic ore in Yunnan Province of China was studied to improve the grades and recoveries of zinc and indium of the zinc concentrate in Dulong concentration plant. The experimental results indicated that copper sulfate mixed with a chemical reagent X-1 as the activator in the marmatite flotation produced a much better beneficiation than copper sulfate alone, increasing the zinc and indium recoveries of 10% and 6%, respectively, while the concentrate grades remained unchanged. Also, the new activator acted well around pH 10, allowing large savings on lime consumption in the marmatite flotation. In addition, it has been found that a sufficient activated time of activator with ore slurry in the flotation is needed to achieve good beneficiation of the marmatite ore.
DOI: 10.1016/S1001-0521(08)60096-0

## Influence of suspension stability on wet grinding for production of mineral nanoparticles

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PARTICUOLOGY, [ELSEVIER SCIENCE INC, NEW YORK], APR, 2008, Vol. 6(2), pp. 120-124.

Grinding behavior of nanoparticles in an attritor mill and the minimum achievable particle size are strongly influenced by the suspension stability. In the present work, suspension stability (i.e. zeta-potential) of nanoparticles was studied by measuring pH as a function of grinding time in the wet milling process. It was found that after a certain time in an attritor mill, there is no further size reduction and the average product particle size increases monotonically. One of the reasons is that the production of submicron particles leads to more particle-particle interactions and consequently pH of the suspension decreases with grinding time. Usually pH value is related to suspension stability and it can be enhanced by addition of NaOH solution. The maximum negative zeta-potential of -51.2 mV was obtained at pH of 12 for silica. The higher the zeta-potential with the same polarity, higher will be the electrostatic repulsion between the particles. Hence, the maximum electrostatic repulsion force was maintained by the adjustment of pH value in wet milling. The experiments were conducted at different pH conditions which were maintained constant throughout the experiments and nanosized particles were obtained consequently. 
DOI: 10.1016/j.partic.2007.12.001

## Adsorption Mechanism of Longchain Alkylamines on Quartz and Albite

Vidyadhar, A; Das, Avimanyu and Rao, Hanumantha K
In: International Seminar on Mineral Processing Technology (MPT-2008) , April 22-24, 2008, Trivandrum,INDIA.

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The mechanism of adsorption of long-chain alkylamines at pH 6-7 onto quartz and albite using the direct methods of FTIR and XPS spectroscopy. The spectroscopic data were correlated with the data of indirect methods of zeta-potential measurements and Hallimond flotation results. It was shown from infrared spectra that the amine cation forms strong hydrogen bonds with surface silanol groups. The XPS spectra revealed the presence of molecular amine together with the protonated amine on silicate surface. Based on these observations, a model of successive two-dimensional and three-dimensional precipiation was suggested to explain amine adsorption on silicate surface.
http://eprints.nmlindia.org/3740/

## Designing Process for Concentration of a Low Grade Copper Ore

Singh, Ratnakar; Chandrashekhar, S; Rath, R K; Nayak, B and Bhattacharyya, K K
In: International Seminar on Mineral Processing Technology (MPT-2008) , April 22-24, 2008, Trivandrum,INDIA.

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The paper deals with the results of chracterisation and flotation studies carried out on a low grade and complex copper ore sample with a view to design process for its concentration. Flotation studies were carried out under varying conditions of process parameters. Effects of gran-ulametry of the feed, dosage of sodium iso-propyl xanthate as collector, pH and gangue depressant dispersant were studied. Sulphidization technique and use of potassium octyl hydroxamate as auxiliary collector for flotation of oxidised minerals was observed to enhance copper recovery. Use of sodium silicate as depressant/dispersant for sili-ceous gangues helped in improving grade of copper conce-ntrate. Rougher followed by multi-stage cleaning were found necessary to produce a high grade copper concentrate. Based on the studies undertaken the process was designed for concentration of the low grade copper ore sample.
http://eprints.nmlindia.org/4149/

## Investigation of the optical waveguide realisation based on polymers with large third order non-linear susceptibility

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ORGANIC OPTOELECTRONICS AND PHOTONICS III, Conference on Organic Optoelectronics and Photonics III, APR 07-10, 2008, Strasbourg, FRANCE, [SPIE-INT SOC OPTICAL ENGINEERING, BELLINGHAM], 2008, 6999

Conjugated polymer materials have great potential to be suitable candidates for use in all-optical network communications. They possess ultra-fast response times and a large third order non-linearity compared to minerals (third order susceptibility X-(3) of conjugated polymers can be 4 orders of magnitude larger than that of fused silica). Such large non-linearitics would allow the fabrication of compact all-optical devices at low power levels. Here we present the first investigations into the creation of a conjugated polymer single mode optical waveguide based on Poly(3-AlkylThiophene) (P3AT). We first synthesized the P3AT and tried to control the chemical reaction conditions in order to improve polymer solubility in common organic solvents. In parallel, we studied the engineering of P3AT single mode waveguide structures made by photolithography techniques which requires the adjustment of P3AT thermo-mechanical properties. Recently, we have been able to fabricate and measure the parameters of Strip-Loaded and buried waveguides with usual polymers. We intend to adapt these processes to obtain the first P3AT single mode optical waveguide.
DOI: 10.1117/12.779275

## Food engineering applications in seafood processing

Sathivel, S
INTERNATIONAL SMOKED SEAFOOD CONFERENCE PROCEEDINGS, International Smoked Seafood Conference, MAR 05-07, 2007, Anchorage, AK, [ALASKA SEA GRANT COLL PROGRAM, FAIRBANKS], 2008, Vol. 2, pp. 65-66.

Small fish processors and entrepreneurs are interested in producing small-scale, cost-effective fish oil extraction, clarification, and stabilization methods for oil for human consumption. Unpurified oils produced from fish byproducts contain non-triglycerides such as free fatty acids, oxidized components, protein, minerals, and insoluble impurities that reduce quality. These components need to be removed before the oil will be acceptable to many markets. Conventional fish oil refining is achieved through four separate steps: degumming, neutralizing, bleaching, and deodorizing. Phospholipids are removed by degumming. Free fatty acids (FFA) are precipitated as soaps and removed during the neutralization process. Bleaching clays adsorb pigments from oil, and oxidized components can be removed by deodorization. The main disadvantages of conventional methods are high refining losses, additional oxidation, and high energy/processing costs. Adsorption technology can potentially provide a simplified process for refining fish oil for human consumption. This research has shown that an adsorption process used for edible oil purification not only removes non-triglycerides but also is a cost-effective process.

## Study of native gold from the Luopensulo deposit (Kostomuksha area, Karelia, Russia) using a combination of electric pulse disaggregation (EPD) and hydroseparation (HS)

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MINERALS ENGINEERING, Conference on Precious Metals, AUG, 2007, Brisbane, AUSTRALIA
[PERGAMON-ELSEVIER SCIENCE LTD, OXFORD], MAY, 2008, Vol. 21(6), pp.463-470.

The mineralogy of a gold-sulphide-arsenopyrite ore from the Kostomuksha iron deposit region was studied by scanning electron microscopy (SEM) in hydroseparation (HS) products from various non-magnetic fractions (40-300 mu m) after EPD crushing. The computer controlled hydroseparator CNT HS-11 produced a 100x concentration of native gold grains together with other ore minerals. Selection of > 150 native gold grains from HS concentrates shows a grain size distribution of 1-154 mu m (average 33 mu m). Measured, upgraded gold reports as liberated grains (46.0%), as intergrowths with arsenopyrite (14.2%), lollingite (19.7%), native bismuth (17.1%), and in association with pyrrhotite (0.9%) and chlorite/apatite (2.0%). High recoveries of native gold are explained in terms of the combined effects of selective grain-boundary fracture induced by EPD crushing, resulting in preservation of metallic mineral aggregates and grain boundaries, even within large native Au/Bi particles (such soft particles would otherwise show significant changes during normal comminution methods). High gold recoveries should thus be possible using traditional gravity and flotation followed by cyanidation. A combined EPD/HS protocol demonstrates the unique possibilities of this technology for laboratory-scale gravity recoverable gold (GRG) testing. 

DOI: 10.1016/j.mineng.2008.02.006

## Basics for geotechnical engineering explorations considering needed legal changes

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OIL SHALE, [ESTONIAN ACADEMY PUBLISHERS, TALLINN], 2008, Vol. 25(2), pp. 189-196.

Nowadays legal system of Estonia does not cover essential aspects related to geotechnical engineering explorations for assessing environmental risks to be considered during planning processes and for providing designers with reliable geotechnical parameters for sustainable construction solutions. The absence of appropriate legal regulation does not support the reuse of mined areas and sustainable use of mineral recourses. The article deals with analysis on planning and building sectors with concrete suggestions for changes in legal regulations. Additionally radon level survey and geotechnical inspection related issues have analysed in the frame of risk assessment. Both of the above issues are especially important to be considered in mined areas. The utilisation of previous research data and re-establishment of

Geotechnical Fund will enable a much more economical use of the available resources and a better management of possible risks.
DOI: 10.3176/oil.2008.2S.10

## Bio-oxidation of galena particles by Acidithiobacillus ferrooxidans

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PARTICUOLOGY, [ELSEVIER SCIENCE INC, NEW YORK], APR, 2008, Vol. 6(2), pp. 99-105.

This paper deals with the bio-oxidation of galena particles (-80 meshes) using Acidithiobacillus ferrooxidans and compares it with Fe(3+) oxidation. Experimental results show that, at least, 0.00197 mol galena was leached from 100 mL pulp (density of 3.8%) with 39 days' bio-oxidation, as compared to 0.00329 moll galena by Fe(3+) with 9 days' oxidation. Because Fe(3+) was constantly consumed, leaching by Fe(3+) almost stopped after 9 days. Large amounts of lead sulfate were detected in both bio-oxidation and Fe(3+) oxidation of galena. A. ferrooxidans followed a unique growth pattern during the bio-oxidation of galena. In the initial 15 days, the bacteria attached themselves to the galena surface with the formation of erosion pits similar in shape and length to those of the bacteria, and there were hardly any bacteria suspended in the solution. After 15 days, suspended bacteria increased. It is thus suggested that A. ferrooxidans may directly oxidize galena. 
DOI: 10.1016/j.partic.2007.11.004

## Effect of operational parameters on the breakage mechanism of silica in a jet mill

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MINERALS ENGINEERING, [PERGAMON-ELSEVIER SCIENCE LTD, OXFORD], APR, 2008, Vol. 21(5), pp. 380-388.
Fine grinding of silica was carried out in a jet mill, varying operational parameters such as feed rate, classifier rotational speed and grinding pressure. The size reduction of silica was intensive as the jet mill is energy intensive. Abrasive and destructive breakage mechanisms took place varying according to the operating conditions of the jet mill. The minimum particle size obtained was 3.15 mu m with a span value of 1.30. The circularity value of the ground silica ranged from 1.29 to 2.02. Particles ground at lower grinding pressure exhibited more or less spherical shapes whilst at higher grinding pressure, elongated particles with sharp edges were produced. 
DOI: 10.1016/j.mineng.2007.10.011

## Fine chemical processing: On-stream particle size analysis

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FILTRATION & SEPARATION, [ELSEVIER ADVANCED TECHNOLOGY, OXFORD], MAY, 2008, Vol. 45(4), pp. 26-28.

Fine chemical processing isn't just about traditional pharmaceutical production, but also includes the processing of high grade minerals. In this article, application engineer Eric Hendrix takes a look at the use of particle size analysis to improve performance and efficiency.

## Ink setting on coated media - Importance of pore structure and latex content

Strom, G; Karathanasis, M
SECOND INTERNATIONAL PAPERMAKING AND ENVIRONMENT CONFERENCE, PROCEEDING, BOOKS A AND B, 2nd International Papermaking and Environment Conference, MAY 14-16, 2008
Tianjin, PEOPLES R CHINA, [CHINA LIGHT INDUSTRY PRESS, BEIJING], 2008, pp. 894-900.

Paper coatings are porous layers made up of mineral pigments, latex binder and a complex pore system. When coated paper and board are printed in sheet-fed offset, the ink oil becomes absorbed by the coating while the binder and pigment stay on top of the surface of the coating. The initial part of the oil absorption is recognized as ink setting. This process depends on both coating and ink properties, and the papermaker strives to engineer the coating for optimal ink setting properties. Too fast an ink setting may be detrimental for print gloss, in particular on gloss-coated substrates, while too slow an ink setting may give problems like piling, blocking and smearing. Unevenness in print, print mottle for instance is often due to an uneven ink setting. The mechanism of ink setting is not fully understood although the general understanding has drastically improved during the last two decades. The oil is basically absorbed by the pore system in a process called capillary absorption. However, there is also absorption by the latex binder by means of molecular diffusion, which results in latex swelling. The aim of the present paper was to learn about the relative importance of the capillary absorption and latex swelling. This was accomplished in a laboratory study where the binder amount in the coating was increased from 8 parts to 100 parts per 100 parts pigment, and by measuring the pore structure and ink setting using various techniques. It was concluded that capillary absorption was the main mechanism during the initial setting, while both capillary absorption and latex swelling controlled the time it took for the print to become touch-dry.

## Advanced computational tools for cement plants

Akhtar, SS; Abbas, T; Lockwood, FC
2008 IEEE CEMENT INDUSTRY TECHNICAL CONFERENCE RECORD, IEEE Cement Industry Technical Conference, MAY 18-22, 2008, Miiami, FL, [IEEE, NEW YORK], 2008, pp. 154-169.

This paper describes the application of mathematical modelling, in particular computational fluid dynamics (CFD), to solve fluid flow, heat transfer, combustion and emissions problems for the cement industry. Whereas traditional physical modelling is limited to isothermal gas phase aerodynamics studies, CFD handles chemical reaction, convective and thermal radiation heat transfer, and the particle/gas flow interactions. In this paper, a new mineral interactive version (MI-CFD) is presented, in which mineral reactions are directly coupled to the flow, heat transfer and combustion processes. The procedure has been applied to over 100 plants worldwide. Example applications to cyclone, calciner and emissions-reduction problems are described herein. Very significant benefits to the cement industry have resulted in terms of fuel costs savings, reduced capital costs, increased production, the ability to comply with environmental legislation and the securing of environmental permits. MUD has proven its value to both old and contemporary plants, including those under design/construction, where unconventional fuels or innovative pyro-processing arrangements have posed major engineering challenges. A specially-devised simpler mathematical model, enabling the effects of changing daily operational parameters to be forecast, is also described.

## Study of native gold from the Luopensulo deposit (Kostomuksha area, Karelia, Russia) using a combination of electric pulse disaggregation (EPD) and hydroseparation (HS)

Cabri, LJ; Rudashevsky, NS; Rudashevsky, VN; Gorkovetz, VY
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MINERALS ENGINEERING, Conference on Precious Metals, AUG, 2007, Brisbane, AUSTRALIA
[PERGAMON-ELSEVIER SCIENCE LTD, OXFORD], MAY, 2008, Vol. 21(6), pp.463-470.

The mineralogy of a gold-sulphide-arsenopyrite ore from the Kostomuksha iron deposit region was studied by scanning electron microscopy (SEM) in hydroseparation (HS) products from various non-magnetic fractions (40-300 mu m) after EPD crushing. The computer controlled hydroseparator CNT HS-11 produced a 100x concentration of native gold grains together with other ore minerals. Selection of > 150 native gold grains from HS concentrates shows a grain size distribution of 1-154 mu m (average 33 mu m). Measured, upgraded gold reports as liberated grains (46.0%), as intergrowths with arsenopyrite (14.2%), lollingite (19.7%), native bismuth (17.1%), and in association with pyrrhotite (0.9%) and chlorite/apatite (2.0%). High recoveries of native gold are explained in terms of the combined effects of selective grain-boundary fracture induced

by EPD crushing, resulting in preservation of metallic mineral aggregates and grain boundaries, even within large native Au/Bi particles (such soft particles would otherwise show significant changes during normal comminution methods). High gold recoveries should thus be possible using traditional gravity and flotation followed by cyanidation. A combined EPD/HS protocol demonstrates the unique possibilities of this technology for laboratory-scale gravity recoverable gold (GRG) testing. 
DOI: 10.1016/j.mineng.2008.02.006

## The development and implementation of industrial hydrometallurgical gallium and germanium recovery (Reprinted)

Fayram, TS; Anderson, CG
JOURNAL OF THE SOUTH AFRICAN INSTITUTE OF MINING AND METALLURGY, [SOUTH AFRICAN INST MINING METALLURGY, MARSHALLTOWN], MAY, 2008, Vol. 108(5), pp. 261-271.

The Gordonsville operation of Pasminco US Inc. along with the center for Advanced Mineral and Metallurgical Processing (CAMP) at Montana Tech studied, developed and implemented a pilot-scale hydrometallurgical facility for the industrial recovery of germanium and gallium. This paper describes the joint testing and engineering programme that culminated in this successful process.

## The impact of ants on mineral soil properties and processes at different spatial scales

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JOURNAL OF APPLIED ENTOMOLOGY, [BLACKWELL PUBLISHING, OXFORD], MAY, 2008, Vol. 132(4), pp. 285-294.

Soil dwelling ants are important soil engineers that have a large impact on the soil ecosystem. This is reflected in the alteration of soil properties by ants due to burrowing activities, the accumulation of organic matter and other nutrients in the soil, which, in turn, alters soil physical, chemical and (micro) biological processes. A review of recent literature on these fine scale soil changes resulting from ant activity is presented in this paper. However, ants do not only affect soil properties at the fine scale but also have effects at the hillslope and catchment scales with respect to surface hydrological processes and ecosystem functioning. At the finest scale, most studies showed changed soil textures, lowered bulk densities and increased infiltration where ant burrows or mineral mounds are prominent. Only a few studies investigated the effects of ants on soil properties such as soil structure and aggregate stability, which were improved by ant activity. Nutrients were generally considered to be concentrated in nests, and increased nutrient cycling involving microbial processes were reported. On a

broader scale, the information on nest densities and patterns is crucial to understand the impacts of ants, but this information is scarcely available. It has been reported that the activity of ants increases the heterogeneity of soil infiltration rates and nutrient concentrations at the landscape scale, which in turn has consequences for the redistribution of sediments and nutrients by geomorphological and biotic processes. A hierarchical descriptive model focusing on dry land ecosystems is presented to incorporate small-scale ant activity into broader scale hillslope and catchment processes. However, this model has to be tested and more research is needed, especially on these broader scale aspects, to be able to fully understand the role of ants on the ecosystem and landscape scale.
DOI: 10.1111/j.1439-0418.2008.01281.x

## Review of International Biohydrometallurgy Symposium, Frankfurt, 2007

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HYDROMETALLURGY, [ELSEVIER SCIENCE BV, AMSTERDAM], MAY, 2008, Vol. 92, pp. 69-72.

This article reviews the proceedings of the 17th International Biohydrometallurgy Symposium held in Frankfurt, Germany from September 2-6, 2007. Topics included, but were not limited to: microbiology and engineering of bioleaching, bioremediation, microbe-mineral interfacial processes, biosorption and nano-biotechnology. This review highlights aspects of biotechnological relevance. The various papers amply demonstrate that an ancient biotechnology has come of age with the commissioning of the world's largest microbial bioreactor at Escondida in Chile sending a strong message that bioleaching is a practical technology. A Special Edition of Hydrometallurgy later this year will feature selected papers from this Symposium that have been peer reviewed.

DOI: 10.1016/j.hydromet.2008.01.003

## Role of sedimentation and resuspension of particulate matter in fluctuations of trophic status of the Neva Estuary

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2008 IEEE/OES US/EU-Baltic International Symposium, IEEE/OES Us/EU-Baltic International Symposium, MAY 27-29, 2008, Tallinn, ESTONIA, [IEEE, NEW YORK], 2008, pp. 481-487.

Primary production of phytoplankton, concentrations of chlorophyll a, suspended particulate organic and mineral matters and total phosphorus were measured in the Neva Estuary during the field summer expeditions in 2003-2007. Obtained data were compared with the results of earlier investigations. Impacts of natural and anthropogenic factors on the trophic status of the Neva Estuary have been analyzed. Relationships

between biotic and abiotic environmental factors of natural and anthropogenic origin, which influence the trophic status of the Neva Estuary, have been analyzed. Analysis of the data shows that fluctuation of trophic status of the inner part of the Neva Estuary closely related with resuspension and sedimentation processes. Resuspension of bottom sediments during engineering works in the Neva Estuary probably lead to return of phosphorus to water column and to involvement of phosphorus into small biological cycle of elements. Moreover, according to our data, maximum rate of photosynthesis and concentration of chlorophyll a in the Neva Estuary were observed in zone of geochemical barrier, where fresh river waters mix with saline marine waters. The main part of suspended matter in the Neva Estuary deposited in the zone of geochemical barrier, which is characterized by the highest rate of photosynthesis. The investigations have shown that primary production of the Neva Estuary affected by sedimentation and resuspension of particulate matter and its transformation in a water column. Combine influence of natural and anthropogenic factors (resuspension and sedimentation of particulate matter) results in considerable fluctuation of the trophic status of the Neva Estuary during the last thirty years.

## Non-invasive optical characterization of biomaterial mineralization

Gupta, S; Hunter, M; Cebe, P; Levitt, JM; Kaplan, DL; Georgakoudi, I
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BIOMATERIALS, [ELSEVIER SCI LTD, OXFORD], MAY, 2008, Vol. 29(15), pp. 2359-2369.

Current approaches to study biomaterial mineralization are invasive and prevent dynamic characterization of this process within the same sample. Polarized light scattering spectroscopy (LSS) may offer a non-invasive alternative for assessing the levels of mineralization as well as some aspects of the organization of the mineral deposits. Specifically, we used LSS to characterize the formation of hydroxyapatite deposits on three types of silk films (water-annealed, methanol-treated and polyaspartic acid (PAA)-mixed) following 1, 3, 5 and 7 cycles of mineralization. We found that the total light scattering intensity provided a quantitative measure of the degree of mineralization as confirmed by thermal gravimetric analysis (TGA). The PAA-mixed silk films yielded the highest level of mineral deposition and the water-annealed ones the least, consistent with the beta sheet content of the films prior to the onset of mineralization. The wavelength dependence of the singly backscattered light was consistent with a self-affine fractal morphology of the deposited films within scales in the range of 150-300 nm; this was confirmed by Fourier analysis of scanning electron microscopy (SEM) images of the corresponding films. The deposits of minerals in the water-annealed films were predominantly flake-like, with positively correlated density fluctuations (Hurst parameter, $H > 0.5$), whereas methanol-treated and PAA-mixed silk films resulted in densely-packed, bulk mineral deposits with negatively correlated density fluctuations ($H < 0.5$). Therefore, LSS could serve as a valuable tool for understanding the role of biomaterial properties in mineral formation, and, ultimately, for

optimizing biomaterial designs that yield mineral deposits with the desired organization.

DOI: 10.1016/j.biomaterials.2008.01.034

## Contributions to Geotechnique 1948-2008: Soil science and interdisciplinary aspects of geotechnical engineering

Soga, K; Jefferis, SA
GEOTECHNIQUE, [THOMAS TELFORD PUBLISHING, LONDON], JUN, 2008, Vol. 58(5), pp. 441-448.

It has long been recognised that soils are not simply assemblages of inert mineral grains, but complex systems within which multiple phenomena can occur. Our objective in this overview is to highlight the key papers and concepts in mineralogy, pollution and the environment that that have been published in Geotechnique over the last 60 years, and to consider the future directions for progress in these areas of geotechnical engineering. To provide a framework for our review we have adopted the concept of coupled phenomena, and we have considered six processes (mechanical, hydrological, chemical, electrical, thermal and biological). By reviewing the major technical achievements in the areas of chemical, electrical, thermal and biological effects on soil systems, the importance of a sound understanding of these phenomena in geotechnical and geoenvironmental engineering is highlighted. We conclude that, although much excellent work has been published in Geotechnique, there are still many opportunities and challenges offered by soil processes, and especially low-intensity chemical and biological processes.
DOI: 10.1680/geot.2008.58.5.441

## Evaluation of frother performance in coal flotation: A critical review of existing methodologies

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MINERAL PROCESSING AND EXTRACTIVE METALLURGY REVIEW, [TAYLOR & FRANCIS INC, PHILADELPHIA], 2008, Vol. 29(4), pp. 275-298.

Separation efficiency in flotation depends, to a considerable extent, on the efficiency of the frother used. A successful frother must achieve a delicate balance between froth stability and non-persistency. Ideally, the frother is not supposed to influence the state of the surface of the coal and minerals. In practice, however, interaction does occur between the frother, other reagents, and solid surfaces. Various commercially available frothers can differ slightly or significantly in their influence on the flotation results. Therefore, a plant operator is in a dilemma when it comes to selecting a frother to be used in his plant. This article attempts to critically review the different methodologies, which are available to compare the performance of two or more frothers in order to decide which would best serve the purpose of the plant operator.

DOI: 10.1080/08827500701856844

## Engineering and regulatory challenges facing the development of commercially viable offshore wind projects

Rodgers, M; Olmsted, C
MARINE TECHNOLOGY SOCIETY JOURNAL, [MARINE TECHNOLOGY SOC INC, COLUMBIA], 2008, Vol. 42(2), pp. 44-50.

Cape Wind is a proposal to locate America's first offshore wind farm off the coast of Massachusetts to generate renewable energy. First proposed in 2001, Cape Wind has faced numerous engineering and regulatory challenges. Great care was taken in the site selection process to ensure a technically and economically viable project that would generate wind energy on a utility scale. The regulatory environment and permitting process for Cape Wind has always been extensive and comprehensive, comprised of federal, state and local agencies. As a result of the Energy Policy Act of 2005, the lead federal permitting agency changed from the U.S. Army Corps of Engineers (ACOE) to the Minerals Management Service (MMS), which resulted in a significant delay in the permitting schedule. Throughout the Environmental Impact Statement process with the ACOE and the MMS, numerous engineering and scientific studies have been performed on a wide host of environmental and economic issues. MMS issued a Draft Environmental Impact Statement in January, 2008. MMS officials have stated they expect to issue the Final Environmental Impact Statement in fall, 2008 and to issue a Record of Decision on Cape Wind thirty days later.

## Experimental investigations of the reaction path in the MgO-CO(2)-H(2)O system in solutions with various ionic strengths, and their applications to nuclear waste isolation

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APPLIED GEOCHEMISTRY, [PERGAMON-ELSEVIER SCIENCE LTD, OXFORD], JUN, 2008, Vol. 23(6), pp. 1634-1659.

The reaction path in the MgO-CO(2)-H(2)O system at ambient temperatures and atmospheric CO(2) partial pressure(s), especially in high-ionic-strength brines, is of both geological interest and practical significance. Its practical importance lies mainly in the field of nuclear waste isolation. In the USA, industrial-grade MgO, consisting mainly of the mineral periclase, is the only engineered barrier certified by the Environmental Protection Agency (EPA) for emplacement in the Waste Isolation Pilot Plant (WIPP) for defense-related transuranic waste. The German Asse repository will employ a Mg(OH)(2)-based engineered barrier consisting mainly of the mineral brucite. Therefore, the reaction of periclase or brucite with carbonated brines with high-ionic-strength is an important process likely to occur in nuclear waste repositories in salt formations where bulk MgO or Mg(OH)(2) will be employed as an engineered barrier. The reaction path in

the system MgO-CO(2)-H(2)O in solutions with a wide range of ionic strengths was investigated experimentally in this study. The experimental results at ambient laboratory temperature and ambient laboratory atmospheric CO(2) partial pressure demonstrate that hydromagnesite (5424) (Mg(5)(CO(3))(4)(OH)(2) center dot 4H(2)O) forms during the carbonation of brucite in a series of solutions with different ionic strengths. In Na-Mg-Cl-dominated brines such as Generic Weep Brine (GWB), a synthetic WIPP Salado Formation brine, Mg chloride hydroxide hydrate (Mg(3)(OH)(5)Cl center dot 4H(2)O) also forms in addition to hydromagnesite (5424). The observation of nesquehonite (MgCO(3) center dot H(2)O) and subsequent appearance of hydromagnesite (5424) in the experiments in a Na-Cl-dominated brine (ERDA-6) at room temperature and P(CO2) = 5 x 10(-2) atm allows estimation of the equilibrium constant (log K) for the following reaction: Mg(5)(CO(3))(4)(OH)(2) center dot 4H(2)O + CO(2)(g) + 10H(2)O = 5MgCO(3) center dot 3H(2)O as similar to 2.5 at 25 degrees C. The logK for the above reaction at 5 degrees C is calculated to be similar to 4.0 by using the Van't Hoff equation. By using these equilibrium constants, the co-existence of hydromagnesite (5424) with nesquehonite in various, natural occurrences such as in weathering products of the meteorites from the Antarctic and serpentine-rich mine tailings, can be well explained. Since the stoichiometric ratio of Mg to C is higher in hydromagnesite (5424) than in nesquehonite, this finding could have important implications for the sequestration of anthropogenic CO(2) in mafic and ultramafic rocks, suggesting that the sequestration of anthropogenic CO(2) is optimal in the stability field of nesquehonite. 
DOI: 10.1016/j.apgeochem.2007.12.035

## Hydrogeochemical Investigations of the Shour River and Groundwater Affected by Acid Mine Drainage in Sarcheshmeh Porphyry Copper Mine

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MINE WATER AND THE ENVIRONMENT, PROCEEDINGS, 10th International-Mine-Water-Association Congress on Mine Water and the Environment, JUN 02-05, 2008, Karlovy Vary, CZECH REPUBLIC
[VSB-TECH UNIV OSTRAVA, OSTRAVA], 2008, pp. 235-238.

Acid mine drainage (AMD) is regarded as the worst environmental problem related to mining that affects surface and groundwater quality. It may be caused when sulphide minerals, especially pyrite, are exposed to air. AMD is generally characterised by high concentrations of iron and sulphate, and low pH. Managing such problems is a major task for mining engineers and environmental groups worldwide. This paper discusses the water pollution problems in the vicinity of the Sarcheshmeh copper mine resulting from AMD originating from waste dumps in the study area. The impacts of AMD on the quality of the surface and groundwater were investigated by sampling the Shour River and wells and springs around the waste dumps, and analysing the samples for hydrogeochemical parameters, particularly toxic metals. The results show the pyrite oxidation process and AMD generation in the waste dumps and their serious impacts on the quality of water bodies. The pH of the water samples in the Shour River varies from

2 to 3.9 and the concentrations of the most of the toxic metals are above their standard limits as presented by World Health Organisation (WHO). Results obtained from such investigations can be used to design an appropriate water quality control program and to propose an effective water treatment system.

## Integrated remediation of an industrial settlement polluted by asbestos

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CONSOIL 2008: THEME G - COMPLETE CASES, 10th International UFZ-Deltares/TNO Conference on Soil-Water Systems, JUN 03-06, 2008, Milan, ITALY, [HELMHOLTZ CENTRE ENVIRONMENTAL RESEARCH-UFZ, LEIPZIG], 2008, 3, 12.

The former Eternit Siciliana S.p.A. plant area, the riprap area and the opposite marine area, included in the Siracusa municipality territory, are the ones of interest. In the past, during the years of industrial activity of the plant (started in the 1953 and ended in the 1993), big quantities of slag scraps and process wastes containing asbestos have been disposed without any preservation of the environment. By the results of the site investigation (audit, survey, sampling, lab analysis, undersea videocam-survey), it was possible to define three main polluted areas: 1) the plant area, 2) the riprap area and, 3) the marine area with a total amount of about 340 cubic meter of asbestos in mineral form, 24.000 square meters of asbestos concrete shingles and 134.000 sqm of polluted soils and marine environment. In the plant area, the preliminary intervention activities have been carried out by traditional building remediation techniques; regarding the buried asbestos, a superficial waterproofing has been made. In the riprap area the remediation activities have been carried out by hand removal of spread material and by mechanical removal of compacted material, by means of a proper engineered mechanical and automated removing and decontaminating cell, designed on purpose for this project. The activities concerning the marine area have been carried out by: a) Preliminary operations (before-activity bathymetric survey, war bombs research survey, intervention of area delimitation by both superficial and deep delimitation to reduce the exchange of sediment and fine material in the marine bottom level), b) Asbestos-concrete material removal (carried out by means of amphibious mechanical excavators and specialized scuba divers), c) Bottom sediments removal (after a final survey, a superficial layer of about 30 cm of sediments has been removed within the work area, in order to refine the intervention) and finally, d) End of works verification: at the end of all MISE activities, the interventions have been verified by a marine bottom inspection with ROV (Remote Operated Vehicles), a chemical-physical characterization of the sediments in place and a final bathymetric survey to check the actual volume of sediment removed.

## Oxidation and metal-insertion in molybdenite surfaces: evaluation of charge-transfer mechanisms and dynamics

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GEOCHEMICAL TRANSACTIONS, [BIOMED CENTRAL LTD, LONDON], Jun, 2008, Vol. 9.

Molybdenum disulfide (MoS(2)), a layered transition-metal dichalcogenide, has been of special importance to the research community of geochemistry, materials and environmental chemistry, and geotechnical engineering. Understanding the oxidation behavior and charge-transfer mechanisms in MoS(2) is important to gain better insight into the degradation of this mineral in the environment. In addition, understanding the insertion of metals into molybdenite and evaluation of charge-transfer mechanism and dynamics is important to utilize these minerals in technological applications. Furthermore, a detailed investigation of thermal oxidation behavior and metal-insertion will provide a basis to further explore and model the mechanism of adsorption of metal ions onto geomedia. The present work was performed to understand thermal oxidation and metal-insertion processes of molybdenite surfaces. The analysis was performed using atomic force microscopy (AFM), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Rutherford backscattering spectrometry (RBS), and nuclear reaction analysis (NRA). Structural studies using SEM and TEM indicate the local-disordering of the structure as a result of charge-transfer process between the inserted lithium and the molybdenite layer. Selected area electron diffraction measurements indicate the large variations in the diffusivity of lithium confirming that the charge-transfer is different along and perpendicular to the layers in molybdenite. Thermal heating of molybenite surface in air at 400 degrees C induces surface oxidation, which is slow during the first hour of heating and then increases significantly. The SEM results indicate that the crystals formed on the molybdenite surface as a result of thermal oxidation exhibit regular thin-elongated shape. The average size and density of the crystals on the surface is dependent on the time of annealing; smaller size and high density during the first one-hour and significant increase in size associated with a decrease in density with further annealing.
DOI: 10.1186/1467-4866-9-8

## Reconciliation of size-density bivariate distributions over a separating node

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PARTICUOLOGY, [ELSEVIER SCIENCE INC, NEW YORK], JUN, 2008, Vol. 6(3), pp. 167-175.

Data reconciliation considers the restoration of mass balance among the noise prone measured data by way of component adjustments for the various particle size or particle

density classes or assays over the separating node. In this paper, the method of Lagrange multipliers has been extended to balance bivariate feed and product size-density distributions of coal particles split from a settling column. The settling suspension in the column was split into two product fractions at 40% height from the bottom after a minute settling of homogenized suspension at start. Reconciliation of data assists to estimate solid flow split of particles to the settled stream as well as helps to calculate the profiles of partition curves of the marginal particle size or particle density distributions. In general, Lagrange multiplier method with uniform weighting of its components may not guarantee a smooth partition surface and thus the reconciled data needs further refinement to establish the nature of the surface. In order to overcome this difficulty, a simple alternative method of reconciling bivariate size-density data using partition surface concept is explored in this paper. 
DOI: 10.1016/j.partic.2008.03.002

## Nanofibrous glass tailored with apatite-fibronectin interface for bone cell stimulation

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JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY, [AMER SCIENTIFIC PUBLISHERS, STEVENSON RANCH], JUN, 2008, Vol. 8(6), pp. 3013-3019.

Exploring a material with smart and biomimetic interface has great potential in the biomaterials and tissue engineering field. This paper reports a novel nanofibrous bone matrix that was developed to retain a cell-stimulating and bone-mimetic biointerface. The bone mineral, apatite, and the cell adhesive protein, fibronectin (FN), were hybridized on the interface of a bioactive glass nanofibrous mesh, through the dissolution-and-reprecipitation process. The hybridized nanofibrous mesh showed significant improvement in the initial responses of the bone-derived cells. It is believed that this biomimetic and cell-stimulating nanofibrous mesh can be used as a potential bone regeneration matrix.
DOI: 10.1166/jnn.2008.106

## Modelling and simulation of vegetable oil processes

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FOOD AND BIOPRODUCTS PROCESSING, [INST CHEMICAL ENGINEERS, RUGBY], JUN, 2008, Vol. 86(C2), pp. 87-95.

A solvent-based extraction process for the production of vegetable oil from soybean has been studied with special emphasis on the solvent recovery section of the process. This solvent recovery section includes four parts: an oil recovery, a condensation system, a

mineral oil system and a water-solvent separation. The main compounds representing the vegetable oil (soybean oil) usually consist of triglycerides, free fatty acids, tocopherols and sterols. The ICAS-ProPred software, an Integrated Computer Aided System developed by CAPEC, has been used to generate the pure compound data and insert them into the database of a commercial simulator (PRO-II). A process model has been developed and validated by matching steady state simulation results from this model with available industrial data. The validated process model has been used to optimize the efficiency of solvent recovery by adjusting operational variables such as pressure and temperature. The paper highlights the modelling and simulation steps together with a sensitivity analysis for the search for an optimal solution of the process in terms of solvent recovery. 
DOI: 10.1016/j.fbp.2008.03.009

## Performance characterization of water-only Cyclone for processing high ash Indian coal.

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Metals Materials and Processes, 20 (4). pp. 265-280.

In this study semi-empirical performance models have been employed to characterize the performance of water-only cyclone on the basis of experimental data modelling for fine coal cleaning. Experiments have been conducted in the laboratory on a 100 mm water only cyclone. High ash coals used for the experiments belong to the Patherdih and Munidih colliery in the Eastern part of India. Separation based on specific gravity was studied on Patherdih sample whereas size classification analysis has been carried out on Munidih sample. Washability studies on Patherdih sample have been undertaken to determine the specific gravity of effective separation for a desired coal quality. The Mayer curve has been employed to plot float-and-sink analysis from which the Tromp distribution curve is constructed. A reduced efficiency curve has been generated based on specific gravity as well as size classification analysis. Attempts have been made to describe the reduced efficiency curve by employing Rosin-Rammler and Logistic distribution function to characterize the performance of the cyclone. A simplified approach has been proposed to estimate the performance model parameters. Experiments were conducted by varying the operating parameters like spigot diameter, feed inlet pressure and percentage solids in the feed to study the sensitivity of operating conditions. The effect of operating variables on the performance of the cyclone in terms of classification function has been investigated. A graphical user interface (GUI) based user friendly software (HYDROSIM) has been developed based on semi-empirical models for calculating the cut-size (d50) under various operating conditions.