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# Metallogenesis of the Lode Gold Deposit in Ilesha Area of Southwestern Nigeria: Inferences from Lead Isotope Systematics

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(received 29 March, 2005; revised 21 January, 2006; accepted 21 January, 2006)

**Abstract.** Studies were carried out on the geochemistry of 18 representative samples of the granite gneiss host rock, common Pb dates on six granite gneiss whole rock samples, six feldspar sample separates, and six samples from the lode gold deposit in the Ilesha schist belt. The AFM plot for the biotite granite gneiss indicated that its protolith was derived from a subduction related tectonic setting. The granite gneiss had low U/Pb and Th/Pb ratios (0.10 to 0.31 and 0.33 to 1.31, respectively), and upper crustal Pb content of 30-47 ppm. The  $^{207}\text{Pb}/^{204}\text{Pb}$ ,  $^{206}\text{Pb}/^{204}\text{Pb}$ ,  $^{208}\text{Pb}/^{204}\text{Pb}$ , were extremely homogeneous in the host rock, the feldspar, and the pyrite indicating derivation from a subduction related environment like a back arc or island arc. The two-stage Stacy and Kramers (1975) Pb-Pb model dating method of interpretation adopted in this study indicated that the granite gneiss was emplaced at  $2750 \pm 25$  Ma in an orogen. On analysis, common Pb in pyrite yielded an average model age of 550 Ma. This Pb systematics indicated that Au was derived from the volcanics in the Ilesha schist belt by hydrothermal leaching, transported through the same medium and deposited in the massive quartz veins as thio-complexes from which native gold was liberated through interaction of the ore fluid and spinnels in the host rock.

**Keywords:** metallogenesis, orogen, schist belt, isochron, Nigeria geology, protolith, tectonic, gold, lead isotopes, lead dating, granite gneiss

# Search of Clay Deposits in a Dual Geological Environment in the South-Southern Part of Nigeria

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**Abstract.** The presence of clay deposits in the south-southern part of Nigeria was investigated using the electrical resistivity method. The vertical electrical sounding was adopted for the investigation using the Schlumberger electrode arrangement. Resistivity soundings were collected from several locations, which were evenly distributed within the study area to explore the clay deposits. Models were generated for computer iterative technique. Borehole data were also collected using spontaneous potential logging method, as well as driller's log in some selected sites within the study area, so as to correlate surface measurements with borehole records. Analysis based on five depth-related resistivity contour maps, as well as selected cross-sectional profiles, confirm the existing dual regional geological environment of the area. Finally, it was established quantitatively that there were comparatively larger clay mineral deposits in the sedimentary environment than in the basement complex areas.

**Keywords:** clay deposits, vertical electircal sounding, Schlumberger electrode arrangement, dual geological environment, Nigerian clay

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# A Comparative Study of the Transient Response Characteristics of Laboratory-Scale Spray Columns and Packed Columns

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(received February 12, 2004; revised December 21, 2005; accepted January 3, 2006)

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**Abstract.** Transient response characteristics of laboratory-scale spray columns and packed columns were studied by using impulse input tests. Using the results of impulse inputs, the dimensionless E-curves (normalized E-curves) were constructed and the variance ( $\sigma^2$ ) of the exit age distribution function (E), and the dispersion number ( $D/uL$ ), of the columns were computed using the dispersion model. This approach was useful for expressing the extent of mixing quantitatively, as well as evaluation of their comparative performance. It has been found that the dimensionless E-curves of the columns lie between plug flow and perfect mixing and the mixing pattern, whereas the extent of mixing in both spray and packed columns was found to be independent of the lengths of the columns. Nevertheless, the extent of mixing in the packed columns was much greater than in the spray columns.

**Keywords:** liquid-liquid extraction, spray columns, packed columns, transient response, exit age distribution, dispersion number, stimulus response, tracer input technique

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## **Effect on Lipid Composition of Groundnuts Roasted in Electromagnetic Waves of Microwave Oven**

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(received February 10, 2005; revised November 23, 2005; accepted November 29, 2005)

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**Abstract.** The effect of short waves of electromagnetic energy on the lipid composition of peanut oil was studied when peanut seeds were roasted in a microwave oven. The results showed that heat treatment (in microwave oven) caused a slight change in nutritional quality of the oil in respect of fatty acids. Unsaturated and polyenoic fatty acids decreased with the increase of monounsaturated fatty acids in the oil of microwave heated peanut seeds. The oil extracted from the seeds before microwave roasting contained capric, lauric and myristic acids in traces. The oil contained 8.2% palmitic acid, 3.9% stearic acid, 59.87% oleic acid, 22.9% linoleic acid, 1.3% linolenic acid, and 3.7% arachidic acid. The microwave roasted peanut seed oil showed some changes in the fatty acids composition as stearic, linoleic, linolenic and arachidic acids reduced with the increase in the concentrations of oleic, capric, lauric and myristic acids.

**Keywords:** microwave heating, microwave oven, polyenoic fatty fraction, groundnut oil, peanut oil, groundnut roasting, electromagnetic waves, microwave heating

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## Studies on the Lipids of Kinnow Orange Seeds

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**Abstract.** The seeds of *Citrus reticulata* var. Kinnow orange contained 26.0% lipids. The seed oil was examined for its lipids and fatty acids composition. The lipids were fractionated into neutral lipids (96.3%) and polar lipids (3.7%) by thin layer chromatography. The neutral lipids were identified as hydrocarbons (1.2%), wax esters (1.1%), sterol esters (3.2%), triacylglycerols (70.5%), free fatty acids (2.3%), 1,3-diacylglycerols (4.0%), 1,2-diacylglycerols (4.2%), glycolipids (1.6%), sterols (2.1%), 2-monoacylglycerols (3.1%), and 1-monoacylglycerols (3.0%). The polar lipids were identified as phosphatidyl ethanolamines (1.2%), phosphatidyl cholines (0.8%), lysophosphatidyl ethanolamines (0.6%), and phosphatidyl inositol (1.1%). The fatty acids range of all the esterified lipids was C<sub>14:0</sub> – C<sub>18:2</sub>, showing higher percentage of unsaturated fatty acids. The major fatty acids were palmitic, stearic, oleic and linoleic acids.

**Keywords:** *Citrus reticulata*, lipids, fatty acids, triacylglycerols, Kinnow orange, polar lipids, Rutaceae

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## Column Treatment of Brewery Wastewater Using Clay Fortified with Stone-Pebbles

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(received November 27, 2004; revised November 7, 2005; accepted November 30, 2005)

**Abstract.** The study aimed at providing a low-cost treatment for brewery wastewater, which was achieved by mixing clay with stone-pebbles to improve the low permeability of water through clay beds. The combination (clay/stone-pebbles) was used in columns for the treatment of brewery wastewater. The crystal chemistry of the clay samples was studied using X-ray diffractometer. Three principal clay minerals (kaolin, illite and smectite) were detected in the samples. Atomic absorption spectrophotometer was used to study the geochemistry of the clay samples. The results of the geochemical studies showed that all the samples were hydrated aluminosilicates. Performance efficiency studies were conducted to determine the best combination ratio of clay to stone-pebbles, which showed that combination ratio 3:1 (clay/stone-pebbles, w/w) performed better. The flow-rate studies showed that brewery wastewater had longer residence time in non-fortified clay than in fortified clay. The flow-rate of the wastewater in the percolating media varied from one medium to another. Two modes of treatment (batch and continuous) were used. The effluent passed through the continuous treatment mode had better quality characteristics as compared with the effluent passed through the batch treatment mode. The effect of repeated use of the fortified column on the performance efficiency was also studied. The pH, total solids, and the chemical oxygen demand (COD) of the effluent was monitored over time. The results of the COD monitored over time were analysed using breakthrough curves. The different columns were found to have different bed volumes at both the breakthrough and exhaustion points.

**Keywords:** fortified clay column, batch treatment, continuous treatment, brewery wastewater, breakthrough curve, exhaustion point, bed volume

# Clinical Studies on the Circulatory Effects of 'Ramadan' Fasting in Healthy Volunteers

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(received October 8, 2004; revised December 12, 2005; accepted December 31, 2005)

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**Abstract.** Variations in the systolic and diastolic blood pressures, and body weight were studied in 48 volunteers (24 males and 24 females), aged 25-55 years, beginning one week before, during the later days, and one week after the month of Ramadan. The observations were recorded in the morning and evening. The volunteers were divided in six age groups, which ranged between 25-30, 31-35, 36-40, 41-45, 46-50 and 51-55 years. The data of the three phases of the study showed no significant changes in the systolic and diastolic blood pressures and weight of the fasting individuals. There was a slight reduction in the mean weight during the third week of 'Ramadan', which in some cases was restored to normal levels immediately after the 'Ramadan' fasting. It has been concluded from the study that fasting has no adverse effect on the blood circulation and weight of healthy persons.

**Keywords:** blood pressure, weight, 'Ramadan' fasting

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# Natural Occurrence of Ochratoxin 'A' in Raisins in Pakistan

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(received December 31, 2004; revised December 1, 2005; accepted December 27, 2005)

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**Abstract.** Grape raisins have become an important commodity in Pakistan. Ochratoxin 'A' and aflatoxin B<sub>1</sub> are important mycotoxins from the human health point of view, which were determined in unclean grape raisins collected from local vendors during 1999-2002. A total of 160 samples of these raisins were analyzed for the quantitative detection of ochratoxin 'A' and aflatoxins. No aflatoxins were detected in any of the raisin samples above the detection limit of 1 $\mu$ g/Kg. Ochratoxin 'A' was determined using two different methods. Method-I involved methanol-aqueous extraction of the raw unclean raisins, followed by the adjustment of the extract to pH 2 with 2 N hydrochloric acid, and partitioned into chloroform. Method-II involved methanol-equeous extraction, followed by cleanup with the clarifying agent, ammonium sulfate, and partitioned into chloroform. The minimum amount of ochratoxin 'A' detected in the samples, with method-I, was  $3.2 \pm 0.9$   $\mu$ g/Kg, while with method-II the minimum value noted was  $9.7 \pm 0.8$   $\mu$ g/Kg. The maximum amount determined in the samples analysed using method-I was  $16.8 \pm 2.7$   $\mu$ g/Kg, while with method-II the maximum value was  $29.2 \pm 2.9$   $\mu$ g/Kg.

**Keywords:** raisins, ochratoxin 'A', aflatoxin B<sub>1</sub>, mycotoxins, afflatoxins, carcinogenic metabolites

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# Production and Quality Evaluation of Extruded Full-Fat Soy Flour

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**Abstract.** Full-fat soy flour was prepared for human consumption by using extrusion technology. Various process parameters such as feed rate, grain size, moisture content of the ingredients, cooking time, temperature, and speed of the extruder cooker were standardized. The samples of raw soy flour and extruded full-fat soy flour were evaluated by chemical analysis, biological assays, organoleptic evaluation, microbiological analysis and storage stability. Soy flour prepared by extrusion cooking with 22 % moisture content at 138 °C temperature was in the form of creamy white flakes, which had a good taste, flavour, and nutritive value. These flakes remained stable during the storage period of 10 months.

**Keywords:** soy flour, extrusion technology, full-fat flour, soybean

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# The Effect of Processing Conditions on the Quality Characteristics of ‘Garri’ Produced from Cassava (*Manihot esculenta*)

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**Abstract.** The effect of processing conditions, such as fermentation period, pH, and frying time and temperature on the microbiological, biochemical, physicochemical and organoleptic quality characteristics of ‘garri’ produced from cassava (*Manihot esculenta*) were evaluated. Results showed that the total bacterial count increased with the increase in fermentation period to 96 h up to  $1.03 \times 10^8$ , and thereafter decreased when the fermentation period was ended after 120 h. Mixed microbial populations of *Bacillus*, *Streptococcus*, *Staphylococcus* and *Corynebacterium* species dominated the early phase, while *Leuconostoc*, *Lactobacillus*, *Candida*, *Geotrichum* and *Pichia* species dominated the later phase of fermentation. The pH decreased from  $5.04 \pm 0.01$  to  $3.47 \pm 0.02$ , while the titratable acidity at the end of the fermentation period increased from  $0.01 \pm 0.001$  to  $0.04 \pm 0.001$ . With the exception of lipids, moisture and hydrocyanic acid contents, which decreased with fermentation period, the increase recorded in the carbohydrates, proteins, ash, and fibre contents were significant at  $p < 0.05$ . Frying at  $75.5 \pm 0.5$  °C for 20 min drastically reduced the bioload by several folds. Sharp reductions, which were significant at  $p < 0.001$ , 0.01, 0.05, were recorded in the moisture and hydrocyanic acid contents. Different stages of processing impacted significant effects on the sensory attributes evaluated. The recorded observations are likely to be useful for developing viable indices for the production, processing and handling of ‘garri’.

**Keywords:** *Manihot esculenta*, cassava fermentation, cassava processing, cassava ‘garri’

# Thermostable Cyclodextrin Glucanotransferases

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**Abstract.** Hyperthermophilic microorganisms have developed a variety of molecular strategies in order to survive extremely harsh temperatures like 110 °C. For the utilization of natural polymeric substrates, such as starch, they produce special enzymes. The present review focuses on thermostable cyclodextrin glucanotransferases (CGTases; EC 2.4.1.19), which are responsible for the production of cyclodextrins. Only a limited number of thermostable CGTases have been characterized as yet. The thermostable enzymes characterized so far contain all the four conserved regions found in the family-13 of starch-degrading enzymes. The five domains specific for CGTases (**A** to **E**) have been identified in these enzymes and the effects of C-terminal truncation of thermostable CGTases have been analyzed. Furthermore, results of the construction of a chimeric enzyme have been included and practical advantages of thermostable enzymes are discussed.

**Keywords:** cyclodextrin, glucanotransferases, CGTases, hyperthermophiles, chimera, thermostable enzymes, starch depolymerization

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