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Underground Coal Gasification Studies on Chakwal Coal, Punjab, Pakistan

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(received September 20, 2010; revised March 11, 2011; accepted April 11, 2011)

Abstract. Underground coal gasification (UCG) experimentation was carried out on low-rank lignite coal of Eastern Salt Range, Chakwal, Punjab Province, Pakistan. A simulation reactor was designed in laboratory environments and gas input volume, type of gas input, gasification linkage and mode of combustion were investigated. Geological characteristics of the coal were also studied. The composition of emitted gases was evaluated and the syngas having calorific value of 2.42 MJ/m^3 was produced.

Keywords: underground coal gasification, lignite, combustion, gas composition, Chakwal

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The Production of Activated Carbon from Nigerian Mineral Coal *via* Steam Activation

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(received July 19, 2010; revised April 1, 2011; accepted April 11, 2011)

Abstract. Activated carbon was produced from Okpara sub-bituminous coal and Ogwashi brown lignite coal of Nigeria through steam activation at 900 °C and 960 °C each for 30 min and 60 min. Okpara and Ogwashi precursor coals had carbon content of 67.41 and 64.47%, respectively, whereas the bulk density and the ash content were 0.59-0.68 g/mL and 2.56-9.91%, respectively. The former exhibited up to 901.0 mg/g iodine number and Brunauer Emmett Teller (BET) surface area of 604 m^2/g while the latter, iodine number of 998.0 mg/g and 669 m^2/g BET surface area. Both showed adequate porosity indicative of their potential for utilization for commercial production of active carbons.

Keywords: Nigerian coal, activated carbon, steam activation, adsorption capacity

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Biosorptive Removal of Cadmium from Aqueous Solutions by *Pleurotus ferulae:* Equilibrium, Kinetic and Thermodynamic Studies

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(received September 6, 2010; revised January 19, 2011; accepted April 12, 2011)

Abstract. Equilibrium, kinetics and thermodynamic parameters were evaluated to establish the potential usefulness of the *Pleurotus ferulae* biomass for biosorption of cadmium from aqueous solutions. Maximum biosorption was observed at initial pH of 4.5, temperature of 30 °C and at the initial cadmium concentration of 100 mg/L. Pseudo- second order rate expression well fitted the experimental data for cadmium when compared to pseudo-first order kinetic model. Equilibrium analysis using Langmuir and Freundlich models showed that the biosorption process is Langmuir model. The process was exothermic and ΔG^{o} was negative showing spontaneity of the process within the studied temperature range. The possible functional groups on the dried *Pleurotus ferulae* biomass, responsible for the sorption of Cd (II), are: – OH, – NH, – COO^{-} and – C– O.

Keywords: biomass, biosorption, cadmium, *Pleurotus ferulae*

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Fatty Acids, Phospholipids and Sterols Levels of the Skin and Muscle of Tongue Sole Fish

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(received March 1, 2010; revised May 6, 2011; accepted June 21, 2011)

Abstract. The levels of fatty acids, phospholipids and sterols were determined in the skin and muscle of Tongue sole fish on dry weight basis. Results showed crude fat varied from 0.027-0.360 g/100 g; SFA varied from 35.0-36.9% of total fatty acids, total unsaturated fatty acids varied from 42.6-47.3%, PUFA ranged from 0.068-0.149. In the phospholipids, phosphatidylcholine was highest in both skin and muscle, with respective values of 12.7 and 16.1 mg/100 g. The sterols level in the skin varied between 6.86-6.94 (6.90±0.04) mg/100 g and muscle was n.d.-0.961 mg/100 g. Samples had low levels of n^{-6} fatty acids [4.20% (skin) and 0.140% (muscle)] and n^{-3} fatty acids [1.20% (skin) and 2.36% (muscle)].

Keywords: lipid profiles, skin, muscle, tongue sole fish

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Short Communication

Elemental Composition of Date Palm (*Phoenix dactylifera* L.) Using Energy Dispersive X-Rays Spectrometry

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(received March 29, 2010; revised June 21, 2011; accepted July 4, 2011)

Abstract. In the present study, date palm (*Phoenix dactylifera* L.) including fruit and pit (Mashkeel variety) was collected from a local market in Peshawar, Pakistan and analyzed using EDX spectrometry. The results showed the presence of various important elements such as O, C, K, Cl, Ca, S, Mg, Fe, Co and Si in date plam fruit and pit. Sufficient amount of oxygen (>54 wt.%) and carbon (>42 wt.%) were determined in the date palm, which is the evidence of the presence of nutritionally enriched constituents. Similarly, the mineral elements including Na, Ca, Mg, K, Ni, Si, Co, Fe and Mo were present in sufficient quantities.

Keywords: date palm, EDX spectrometry, elemental composition, essential nutrients, Pakistan

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Short Communication

Production and Characterization of Activated Carbon Using Indigenous Waste Materials

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(received October 19, 2010; revised April 25, 2011; accepted April 28, 2011)

Abstract. Activated carbon was produced from shisham wood and coconut shell through chemical activation, using phosphoric acid and low temperature carbonization. Proximate analysis and characterization of the product were carried out and Brunauer Emmett Teller (BET) surface area, total ash content, moisture content, pH value and iodine number were determined. The product characteristics were well comparable with those of the commercially available activated carbon.

Keywords: waste material, activated carbon, chemical activation, carbonization

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Review

Morphological, Hydrolytic and Thermal Properties of Legume Starches

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(received June 3, 2010; revised May 31, 2011; accepted June 7, 2011)

Abstract. Legumes are an excellent source of carbohydrate and provide an inexpensive source of protein. With the exception of beach pea (12.3%), the percentage yields of extracted legume starches fall within the range of 18.0-45.0% on a whole seed basis. The total lipid contents of legume starches range from 0.01-0.87%. Legume starches have variable granule diameters, generally between 4 and 80 µm. Granule shape may be oval, spherical, elliptical or irregular, depending on the source. Legume starches exhibit a two-stage solubilization pattern; the rates of hydrolysis for the first and second stages are identical in some legume starches but differ in others. Most legume starches exhibit C-type X-ray diffraction patterns. The degrees of crystallinity of most legume starches are similar to, or slightly lower than, those of cereal starches. Most legume starches exhibit nearly identical gelatinization transition temperatures and enthalpies. However, their gelatinization temperature ranges ($T_C - T_O$) differ. Legume starches easily retrograde due to their relatively high amylose contents, although long term retrogradation is attributed to short chains of amylopectin.

Keywords: legume, starch, granule morphology, hydrolysis, gelatinization, retrogradation, thermal properties, granule crystallinity

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