treatment on cell wall modification in relation to chilling injury. Loquat fruit developed chilling injury, manifested as increased fruit firmness and internal browning, decreased extractable juice during storage. These chilling injury symptoms were significantly reduced by MeJA treatment. MeJA also markedly delayed the increases in lignin, alcohol insoluble residues, hemicellulose and cellulose. Meanwhile, the MeJA-treated fruit exhibited significantly lower activities of phenylalanine ammonia lyase, peroxidase, polyphenol oxidase and higher polygalacturonase activity than the control during storage. The levels of water- and CDTA-soluble pectins in MeJA-treated fruit were also significantly higher than that in the control. These results suggest that the reduction in chilling injury by MeJA may be due to inhibited lignin accumulation and enhanced cell wall polysaccharides solubilisation [Shifeng Cao, Yonghua Zheng*, Kaituo Wang, Huaijin Rui and Shuangshuang Tang (College of Food Science and Technology, Nanjing Agricultural University, Weigang 1, Nanjing 210095, PR China), *Food Chemistry,* 2010, **11**8(3),641-647].

FUEL (incl. Biogas, Biodiesel, Biomass energy, Ethanol, etc.)

NPARR 1(3), 2010-0440**, The effect of biodiesel and bioethanol blended diesel fuel on nanoparticles and exhaust emissions from CRDI diesel engine**

Biofuel (biodiesel, bioethanol) is considered one of the most promising alternative fuels to petrol fuels. The objective of the work is to study the characteristics of the particle size distribution, the reaction characteristics of nanoparticles on the catalyst, and the exhaust emission characteristics when a common rail direct injection (CRDI) diesel engine is run on biofuel-blended diesel fuels. In this study, the engine performance, emission characteristics, and particle size distribution of a CRDI diesel engine that was equipped with warm-up catalytic converters (WCC) or a catalyzed particulate filter (CPF) were examined in an ECE (Economic Commission Europe) R49 test and a European stationary cycle (ESC) test. The engine performance under a biofuel-blended diesel fuel was similar to that under D100 fuel, and the high fuel consumption was due to the lowered calorific value that ensued from mixing with biofuels. The use of a biodiesel–diesel blend fuel reduced the total hydrocarbon (THC) and carbon monoxide (CO) emissions but increased nitrogen oxide (NO_x) emissions due to the increased oxygen content in the fuel. The smoke emission was reduced by 50% with the use of the bioethanol–diesel blend. Emission conversion efficiencies in the WCC and CPF under biofuel-blended diesel fuels were similar to those under D100 fuel. The use of biofuel-blended diesel fuel reduced the total number of particles emitted from the engine; however, the use of biodiesel–diesel blends resulted in more emissions of particles that were smaller than 50 nm, when compared with the use of D100. The use of a mixed fuel of biodiesel and bioethanol (BD15E5) was much more effective for the reduction of the particle number and particle mass, when compared to the use of BD20 fuel [Hwanam Kim and Byungchul Choi*(Automobile Research Center, Chonnam National University, Gwangju 500-757, Republic of Korea), *Renewable Energy*, 2010, **35**(1), 157-163].

NPARR 1(3), 2010-0441**, Syngas from sugarcane pyrolysis: An experimental study for fuel cell applications**

The use of biomass for the production of electrical energy is a promising technological solution for those countries where there are problems with the disposal of agricultural waste and/or the production of low-cost energy. The gasification and/or pyrolysis of the biomass produce a gas rich in hydrogen that can be used in a fuel cell system to produce electrical energy with reduced environmental impact and significant energy recovery.

In this work, a study of the pyrolysis of Brazilian sugarcane bagasse was carried out. The experimental process consisted of the pyrolysis of the biomass material in a batch pyrolysis reactor. In some runs the biomass was dry, while in others it was pre-treated by the addition of water. It was noted that the water added to the biomass before the pyrolysis process resulted in a decrease in the quantity of steam added to the fuel cell feeding gas, necessary to avoid carbon deposition, and in an increase in cell power, but, at the same time, caused a decrease in the quantity of syngas produced.

Then, the composition of the gas obtained from the experimental pyrolysis of the sugarcane was inserted in a simulation tool of a molten carbonate fuel cell system in order to estimate the feasibility of the entire process in terms of operating conditions and electrical performance. The present study indicates that the syngas obtained from the sugarcane biomass (about 40%) can be converted into electricity using a fuel cell system with a high efficiency [Saleh Al Arni*, Barbara Bosio and Elisabetta Arato (Department of Chemical and Process Engineering, University of Genoa, Via Opera Pia 15, 16145 Genoa, GE, Italy), *Renewable Energy*, 2010, **35**(1), 29-35].

NPARR 1(3), 2010-0442**, Features of sweet sorghum juice and their performance in ethanol fermentation**

As demand for and production of fuel ethanol increase to unprecedented levels, feedstocks for ethanol production will become more diverse. Sweet sorghum is an ideal feedstock for fuel ethanol production in the Southeast and Midwest. Sweet sorghum juices usually contain approximately 16-18% fermentable sugar, which can be directly fermented into ethanol by yeast. Technical challenges of using sweet sorghum for biofuels are a short harvest period for highest sugar content and fast sugar degradation during storage. This study showed that as much as 20% of the fermentable sugars can be lost in 3 days at room temperature because of activities of contaminating bacteria, which lead to significant increases in bacterial count and decreases in *p*H values. No significant changes in *p*H value, sugar contents, and sugar profiles were observed in juices stored in a refrigerator. Fermentation efficiencies of fresh juice, autoclaved juice, and concentrated juice with 20% sugar were higher than 93% in the laboratory shake flask batch process. Fermentation of concentrated juices with 25% and 30% sugars were not complete. Significant amount of fermentable sugars remained in the finished beers of these concentrated juices. Glycerol contents in finished beers from concentrated juices were higher than in beers from normal juices. These results help to identify the most important factors affecting the quality of sweet sorghum juice under different processing and storage conditions, enabling development of effective strategies to process the juice, preserve fermentable sugars, and retain the processing properties of the juice during processing, transportation, and storage [Xiaorong Wu, Scott Staggenborg, Johathan L. Propheter, William L. Rooney, Jianming Yu and Donghai Wang*(Department of Biological & Agricultural Engineering, Kansas State University, Manhattan, KS 66506, United States), *Industrial Crops and Products,* 2010, **31**(1), 164-170].

NPARR 1(3), 2010-0443**, Propagation techniques, evaluation and improvement of the biodiesel plant, *Pongamia pinnata* (L.) Pierre—A review**

The leguminous tree *Pongamia pinnata* (Linn.) Pierre has been receiving considerable attention since its role as a feed stock for biodiesel production was defined and confirmed. Policy makers, scientists as well as farmers have turned their attention to this species with great gusto since the benefits to be derived affect all the stakeholders. Tremendous interest has been generated for raising organized plantations of this untapped species. This has created the need for technology for its propagation and management. Though studies have been conducted on many aspects, the information is scattered. With this in view, the literature on important aspects of propagation, evaluation of genetic resources and improvement has been reviewed to glean the available information which can form the guidelines for raising of plantations to meet the current need. This review also aims to assist in the identification of gaps in information while preventing duplication of research efforts and unnecessary outflow of valuable resources [N. Mukta* and Y. Sreevalli (Directorate of Oilseeds Research, Hyderabad 500 030, India), *Industrial Crops and Products*, 2010, **31**(1), 1-12].

NPARR 1(3), 2010-0444**, Chemical and thermal properties of fractionated bagasse soda lignin**

A major challenge of the 21st century will be to generate transportation fuels using feedstocks such as lignocellulosic waste materials as a substitute for existing fossil and nuclear fuels. The advantages of lignocellulosics as a feedstock material are that they are abundant, sustainable and carbon-neutral. To improve the economics of producing liquid transportation fuels

from lignocellulosic biomass, the development of value-added products from lignin, a major component of lignocellulosics, is necessary. Lignins produced from black liquor through the fractionation of sugarcane bagasse with soda and organic solvents have been characterised by physical, chemical and thermal means. The soda lignin fractions have different physico-chemical and thermal properties from one another. Some of these properties have been compared to bagasse lignin extracted with aqueous ethanol [P. Mousavioun and W.O.S. Doherty* (Centre for Tropical Crops and Biocommodities, Queensland University of Technology, GPO Box 2343, Brisbane, Australia), *Industrial Crops and Products*, 2010, **31**(1), 52-58].

NPARR 1(3), 2010-0445, **Plant oils as fuels for compression ignition engines: A technical review and life-cycle analysis**

As an alternative fuel for compression ignition engines, plant oils are in principle renewable and carbon-neutral. However, their use raises technical, economic and environmental issues. A comprehensive and up-to-date technical review of using both edible and non-edible plant oils (either pure or as blends with fossil diesel) in CI engines, based on comparisons with standard diesel fuel, has been carried out. The properties of several plant oils, and the results of engine tests using them, are reviewed based on the literature. Findings regarding engine performance, exhaust emissions and engine durability are collated. The causes of technical problems arising from the use of various oils are discussed, as are the modifications to oil and engine employed to alleviate these problems. The review shows that a number of plant oils can be used satisfactorily in CI engines, without transesterification, by preheating the oil and/or modifying the engine parameters and the maintenance schedule. As regards life-cycle energy and greenhouse gas emission analyses, these reveal considerable advantages of raw plant oils over fossil diesel and biodiesel. Typical results show that the life-cycle output-to-input energy ratio of raw plant oil is around 6 times higher than fossil diesel. Depending on either primary energy or fossil energy requirements, the life-cycle energy ratio of raw plant oil is in the range of 2–6 times higher than corresponding biodiesel. Moreover, raw plant oil has the highest potential of reducing life-cycle GHG emissions as compared to biodiesel and fossil diesel [A.K. Hossain and P.A. Davies*(Sustainable Environment Research Group, Engineering Systems and Management, School of Engineering and Applied Science, Aston University, Birmingham B4 7ET, UK), *Renewable Energy*, 2010, **35**(1), 1-13].

NPARR 1(3), 2010-0446, **The effect of biodiesel and bioethanol blended diesel fuel on nanoparticles and exhaust emissions from CRDI diesel engine**

Biofuel (biodiesel, bioethanol) is considered one of the most promising alternative fuels to petrol fuels. The objective of the work is to study the characteristics of the particle size distribution, the reaction characteristics of nanoparticles on the catalyst, and the exhaust emission characteristics when a common rail direct injection (CRDI) diesel engine is run on biofuel-blended diesel fuels. In this study, the engine performance, emission characteristics, and particle size distribution of a CRDI diesel engine that was equipped with warm-up catalytic converters (WCC) or a catalyzed particulate filter (CPF) were examined in an ECE (Economic Commission Europe) R49 test and a European stationary cycle (ESC) test. The engine performance under a biofuel-blended diesel fuel was similar to that under D100 fuel, and the high fuel consumption was due to the lowered calorific value that ensued from mixing with biofuels. The use of a biodiesel-diesel blend fuel reduced the total hydrocarbon (THC) and carbon monoxide (CO) emissions but increased nitrogen oxide (NO_x) emissions due to the increased oxygen content in the fuel. The smoke emission was reduced by 50% with the use of the bioethanol–diesel blend. Emission conversion efficiencies in the WCC and CPF under biofuel-blended diesel fuels were similar to those under D100 fuel. The use of biofuel-blended diesel fuel reduced the total number of particles emitted from the engine; however, the use of biodiesel-diesel blends resulted in more emissions of particles that were smaller than 50nm, when compared with the use of D100. The use of a mixed fuel of biodiesel and bioethanol (BD15E5) was much more effective for the reduction of the particle number and particle mass, when com-

pared to the use of BD20 fuel [Hwanam Kim and Byungchul Choi*(School of Mechanical Systems Engineering, Chonnam National University, Gwangju 500-757, Republic of Korea), *Renewable Energy*, 2010, **35**(1), 157-163].

NPARR 1(3), 2010-0447, **Fatty acid methyl esters (FAMEs) from castor oil: Production process assessment and synergistic effects in its properties**

Fatty acid methyl esters (FAMEs) from castor oil have been synthesized by methanolysis catalyzed by sodium methoxide and the optimal transesterification conditions have been found. However, some properties of the castor FAME render it unsuitable in pure state for its direct use as fuel in internal combustion engines. Thus, blends with reference diesel have been prepared and their properties have been evaluated. Among these properties, the oxidative stability of the blends shows a negative anti-synergistic effect, that is, all the blends have an induction period lower than the pure reference diesel and the pure castor FAME. On the contrary, the lubricity shows a positive synergistic effect, the wear scar of the blends being always lower than those of the pure components. The cold-filter plugging point of the blends shows also a singular effect, since the filterability remains identical to that of the reference diesel until around 50vol% of castor FAME has been blended with it. The blends of castor FAME and reference diesel until approximately 40vol% of castor FAME meet most of the specifications of the EN 590 standard [e:Laureano Canoira*, Juan García Galeán, Ramón Alcántara, Magín Lapuerta and Reyes García-Contreras (Department of Chemical Engineering and Fuels, ETS Ingenieros de Minas, Universidad Politécnica de Madrid, Ríos Rosas 21, 28003 Madrid, Spain), *Renewable Energy*, 2010, **35**(1), 208-217].

NPARR 1(3), 2010-0448, **Biodiesel production from residual oils recovered from spent bleaching earth**

This work was to study technical and economic feasibilities of converting residual oils recovered from spent bleaching earth generated at soybean oil refineries into useable biodiesel. Experimental results showed that fatty acids in the SBE residual oil were hexadecenoic acid (58.19%), stearic acid (21.49%) and oleic acid (20.32%), which were similar to those of vegetable oils. The methyl ester conversion via a transesterification process gave a yield between 85 and 90%. The biodiesel qualities were in reasonable agreement with both EN 14214 and ASTM D6751 standards. A preliminary financial analysis showed that the production cost of biodiesel from SBE oils was significantly lower than the pre-tax price of fossil diesel or those made of vegetable oils or waste cooking oils. The effects of the crude oil price and the investment on the production cost and the investment return period were also conducted. The result showed that the investment would return faster at higher crude oil price [Yi-Pin Huang and James I. Chang*(Department of Safety, Health and Environmental Engineering, National Kaohsiung First University of Science and Technology, #1, University Blvd., Yenchao, Kaohsiung, Taiwan ROC), *Renewable Energy*, 2010, **35**(1), 269-274].

NPARR 1(3), 2010-0449, **Assessment of cow dung as a supplementary fuel in a downdraft biomass gasifier**

A model of downdraft gasifier has been described considering thermodynamic equilibrium of species in the pyro-oxidation zone and kinetically controlled reduction reactions in the reduction zone. It is found that the sole use of cow dung as the gasifier fuel is not technically feasible. This is due to very low heating value of the producer gas with much carbon leaving the gasifier as char. However, cow dung can be used as a supplementary fuel blended with a conventional woody biomass, like sawdust. The increased fraction of cow dung in the fuel blend renders the gasification process less efficient, when the gasifier is operated at a particular equivalence ratio. Both the producer gas production rate and its heating value reduce with the increase in the cow dung content in the biomass fuel blend, leading to an overall reduction in the gasifier conversion efficiency. It is observed that an increase in the cow dung content from 0 to 90% in the blended fuel reduces the heating value by 46.8% and the conversion efficiency by 45%. The use of cow dung in between 40 and 50% by mass in the fuel mix would result in an overall fuel economy [Prokash C. Roy, Amitava Datta*and Niladri

Chakraborty (Department of Mechanical Engineering, National Institute of Technology, Silchar, Assam 788010, India), *Renewable Energy*, 2010, **35**(2), 379-386].

GUM/RUBBER (incl. Latex, Resin, Pectin, Mucilage, Cellulose, etc.)

NPARR 1(3), 2010-0450, **Comparing biosorbent ability of modified citrus and durian rind pectin**

Biosorbent ability of modified durian rind, durian rind, citrus and modified citrus pectin for removals of toxic heavy metals was investigated, and data were analyzed using multivariate analysis of variance (MANOVA) and cluster analysis (CA). Degree of esterification (% DE) of the biosorbents ranged between 22.33 and 60.81%, and was in the order; modified citrus pectin < modified durian rind pectin < durian rind pectin < citrus pectin. In most cases the order of biosorbent ability was; modified citrus pectin>modified durian rind pectin, citrus pectin >durian rind pectin. MANOVA showed a significant difference between samples and concentration of biosorbents, while CA classified the four biosorbent samples (based on biosorbent ability) into three different clusters; (1) citrus pectin and modified durian rind pectin, (2) durian rind pectin and (3) modified citrus pectin. The uptake of heavy metal by biosorbents was dependent on chemical structure of pectin and increased with biosorbent concentration and in most cases in accordance with the reduction in % DE [Wong Weng Wai, Abbas F.M. AlKarkhi and Azhar Mat Easa*(School of Industrial Technology, 11800 USM, Minden, Penang, Malaysia), *Carbohydrate Polymers*, 2010, **79**(3), 584-589].

NPARR 1(3), 2010-0451, **Comparison of the effect of sugars on the viscoelastic properties of sweet potato starch pastes**

Viscoelastic properties of sweet potato starch (SPS) pastes (5% w/w) were studied in the presence of various sugars (sucrose, glucose, fructose, and xylose) at different concentrations (0, 10 and 20%) by small-deformation oscillatory measurements. Dynamic frequency sweeps at 20ºC indicated that all SPS-sugar mixtures were more elastic than viscous with storage moduli (G') higher than loss moduli (G'') at all values of frequency with a frequency dependency. Dynamic moduli (G' and G'') values increased with the increase in sugar concentration from 10 to 20%. Changes in the dynamic moduli were more pronounced with xylose in comparison to the control (no sugar) and other sugars. G' values as a function of ageing time (10h) at 4ºC continuously increased with time during ageing without a plateau region. In general, G' values of SPS–sugar mixtures during ageing decreased in the following order: pentose (xylose) >hexose (glucose and fructose) > control > disaccharide (sucrose), indicating that the xylose had the greatest ability in retarding retrogradation of SPS [Sun-A Cho and Byoungseung Yoo*(Department of Food Science and Technology, Dongguk University, 3 Pil-dong, Chung-gu, Seoul 100-715, Korea), *International Journal of Food Science & Technology*, 2010, **45**(2), 410-414].

NPARR 1(3), 2010-0452, **A study of the properties of starch isolated from three varieties of *Lablab purpureus* seeds**

Starch isolated from three varieties of *Lablab purpureus* (Linn.) Sweet: Rongai white, Rongai brown and Highworth black ranged from 13.2-15.8%. The starch granules were similar in shape (oval) and medium in size (12.51-20.56μm) but slightly differed in granule size distribution. The starches exhibited a C-type X-ray diffraction pattern with degree of crystallinity ranging from (37.0-46.3%). The apparent amylose ranged from 23.1-26.0% and absolute amylose was 17.5-23.5% and the two were significantly different (p<0.05). The starches had high onset gelatinization temperatures (T=73.5-75.7ºC), the gelatinization range and enthalpy change were 12.917.7ºC and 12.3-18.8J/g, respectively. The starches had single stage swelling and amylose leaching patterns. The starch pastes exhibited significant shear thinning, low clarity and poor freeze-thaw stability [Louis M. Nwokocha, Kehinde O. Soetan and Peter A. Williams* (Department of Chemistry, University of Ibadan, Ibadan, Nigeria), Carbohydrate Polymers, 2010**,** **79**(3), 685-693].

NPARR 1(3), 2010-0453, **Comparative study of the effect of drying temperatures and heat-moisture**