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BIOMASS: FROM WASTE TO VALUABLE MATERIALS

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Biomass originating from agricultural waste if improperly disposed of will cause emissions of N_2O, SO_2, CH_4 and large amounts of smoke into the atmosphere, causing global pollution problems. Agricultural waste is organic matter disposed of by humans in the process of agriculture and includes waste from crops, chemicals and rural households. Apart from environmental pollution, economic losses caused by traditional disposal of agricultural waste cannot be ignored. Burning agricultural waste, including crop residues, in the open air or the kitchen is one of the main sources of serious air pollution. On the other hand, agricultural waste can be utilized as valuable materials, such as bio-adsorbents, because it has loose and porous structural properties as well as functional groups like carboxyl and hydroxyl. In addition, agricultural waste is available in large quantities, can be recycled, is biodegradable, and is environmentally friendly so that it has good prospects for the comprehensive utilization of resources when used to control environmental pollution.

This special edition contains 20 papers, 9 of which discuss the use of biomass as bio-adsorbents. In addition, there is 1 paper that discusses the production of low-fat ice cream, 2 papers from electrical engineering, 5 papers from mechanical engineering, 1 paper from metallurgical engineering and 2 papers from environmental engineering.

The first paper, written by M. Cornelia and Sanny, proposed to make low-fat pumpkin and date palm ice cream as a source of antioxidants and dietary fiber using different types of stabilizers. Several formulations of ice cream were examined. The best formulation was made with gelatin stabilizer with the addition of pumpkin puree and date palm puree at the ratio of 1:2 and can be categorized as high-fiber ice cream as it contains no less than 6 g of dietary fiber in 100 g formulation.

The second paper, written by A.H.P. Harahap, A.A. Rahman, I.N. Sadrina and M. Gozan, investigated the effect of microwave-assisted alkaline pretreatment of OPEFB by using response surface methodology with Box–Behnken design (BBD) to find the optimum pretreatment conditions. The authors reported that, to achieve the highest lignin removal of 88.10%, the optimal conditions for the pretreatment were a combination of microwave power at 832.9 W, a NaOH concentration at 2.7% (w/v), and a reaction time of 8.9 min.

The third paper, written by R. Desmiarti, Y. Trianda, M. Martynis, A. Viqri, T. Yamada and F. Li, examined phenol adsorption by granular activated carbon from coconut shells in batch experiments under various initial phenol concentrations. The authors reported that, based on the fluorescence spectroscopy results, the Kuranji River DOM contained two major components: humic-like substances and protein-like substances. The maximum removal rate of 92.5% for both types of samples was obtained post-adsorption, as measured by the phenol kit.

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The nanoparticle size distribution also shifted from ranges of 0.72–1.74 nm in raw water to 45.66–726.73 nm and 57.08–1068.47 nm in US-type and S-type water, respectively.

The fourth paper, written by E.F. Karamah, L. Anindita, D. Amelia, E. Kusrini and S. Bismo, studied tofu wastewater treatment through a combined process of ozonation and adsorption using natural zeolite. The chemical oxygen demand (COD) and total suspended solids (TSS) of the tofu wastewater were the parameters observed during the experiments. The authors reported that the best condition for decreasing COD and TSS levels was achieved using an ozone dosage of 155.1 mg/h and 100 g of zeolite, which resulted in COD and TSS removal of 219.4 mg/L and 25 mg/L, respectively, after 60 minutes.

The fifth paper, written by Yuliusman, S.A. Putri, S.P. Sipangkar, M. Fatkhurrahman and F. Al Farouq, studied CO adsorption using modified activated carbon with MgO from biomass waste of durian shell. The authors found that the best non-modified activated carbon was the variation of 3:2, which had a yield of 41.56% with an Iod amount of 399.44 mg/g and a surface area of 694.13 m^2/g. The best modified activated carbon was activated carbon with an MgO concentration of 2%, a yield of 97%, an Iod amount of 625.70 mg/g and a surface area of 1,029.90 m^2/g. Activated carbon with a modification of 2% could degrade the CO with an adsorption rate of 3.89%/gram per minute with an adsorption power of 0.215%.

The sixth paper, written by E.A. Krisanti, N. Hijrianti and K. Mulia, examined chitosan-alginate matrices as biodegradable media for the targeted release of red ginger oleoresin in the gastrointestinal tract. The authors reported that the total phenolic content found in the red ginger rhizome powder was 28 mg GAE/g dry sample powder, while the encapsulation efficiency was as high as 79% and loading capacity as high as 2% (weight ratio of chitosan:oleoresin:alginate of 1:0.1:0.1). The in vitro release assays of ginger oleoresin in simulated gastrointestinal fluids showed that the chitosan-alginate matrices with a weight ratio of chitosan to alginate 1:0.5 have a low release in simulated gastric fluid (4.3%) and moderate release in simulated colonic fluid (40.7%).

The seventh paper, written by H. Hermansyah, D.N. Putri, A. Prasetyanto, Z.B. Chairuddin, M. S. Perdani, M. Sahlan and M. Yohda, investigated the delignification of oil palm empty fruit bunch (EFB) using peracetic acid and alkaline peroxide solution combined with the ultrasound method as the novel combination method of biomass pretreatment. The authors found that the best delignification was achieved by pretreatments using peracetic acid for 3 hours followed by alkaline peroxide for 10 hours. The ultrasound method was employed in both pretreatments. The Lignin content was reduced by 68.73% and cellulose content was increased by 121.85% relative to the untreated EFB.

The eighth paper, written by I. Dinika, B. Nurhadi, N. Masruchin and G. L. Utama, studied the fermentation time in producing peptide and amino acid profiling in the fermentation of native whey cheese using *Candida tropicalis*. The authors reported that the amino acid profile after fermentation decreased all amino acids observed except isoleucine. Fermentation without the addition of *C. tropicalis* continued to increase and showed no peak in peptides until the 48-hour mark. The amino acid profile produced showed an increase in aspartate, glutamate, threonine, valine, isoleucine and lysine and a decrease in serine, histidine, glycine, arginine, alanine, tyrosine and methionine.

The ninth paper, written by M. Sahlan, A.M. Fadhan, D.K. Pratami, A. Wijanarko, K. Lischer, H. Hermansyah and K.F. Mahira, studied the encapsulation of agarwood essential oil with maltodextrin and gum arabic. The authors found that the encapsulation of agarwood oil in the samples showed good results for loading capacity, surface oil content percentage and encapsulation efficiency. The efficiency decreased on the first, fifth, and tenth days in four samples F1, F2, F3, and F4. The surface oil content increased on the first, fifth, and tenth days.

The largest loading capacity, 68.8%, was produced by F2.

The tenth paper, written by A. Sandhyavitri, S. Sutikno, R. Sahputra, R. Amri, H. Widodo, R. R. Husaini and T.H. Seto, simulates and identifies the optimum numbers and locations of fire brigade posts to improve their response times in mitigating peatfire events in Bengkalis Island, Riau, Indonesia. The authors used ArcGIS, ArcCatalog, ArcMap, and the ArcMethodbox for network area analyses. Their study showed that the service coverage of the fire brigade posts improved significantly as a result of an additional number of posts.

The eleventh paper, written by H. Santoso, S.B. Abdinagoro and M. Arief, investigates the relationship among transformational leadership, innovative work behavior, performance and digital literacy as a moderator of the relationship between innovative work behavior and performance. The authors suggested that organizations consider individual and environmental factors in human resource management as the main drivers of innovative work behavior that serve as core elements of continuous company competitiveness. They also discuss the important role of supporting the innovative work behavior of employees in high-tech organizations.

The twelfth paper, written by A. Larasati, A.M. Hajji, A.N. Handayani, N. Azzahra, M. Farhan and P. Rahmawati, identifies the characteristics of academic library patrons, particularly millennial patrons, by using k-means and x-means clustering algorithms. The authors included 935 responses in their study, using both online and offline forms. Their study showed k-means performs better at clustering the behavior of academic library patrons' than x-means, as x-means results in lower Davies-Bouldin index value. However, x-means provides better descriptions of the patrons' behavior in each cluster.

The thirteenth paper, written by Y.N. Thaha, N. Darsono, M.S. Utomo, D. Sajuti and I. Kartika, observes the electrochemical corrosion behavior of Mg-5Zn in $(NH_4)_3PO_4$ and NaF 1% and the effects of malonic acid and succinic acid on the corrosion behavior of Mg-5Zn in $(NH_4)_3PO_4$ and NaF. The authors used the back-scattering electron mode of scanning electron microscopy, electrochemical impedance spectroscopy and potentiodynamic polarization to observe the characteristics of the materials. They found that the presence of 1% succinic acid and 1% malonic acid enhanced the corrosion process of Mg-5Zn in 1% $(NH_4)_3PO_4$ and 1% NaF.

The fourteenth paper, written by M.I. Alhamid, N. Aisyah, Nasruddin, and Arnas Lubis, investigates by simulation the use of two low global warming potential working fluids, HCFO-1224yd(Z) and HCFO-1233zd(E), in high-temperature heat pump systems. The working refrigerants were evaluated through energy, exergy, and environmental analysis. The authors concluded that, in terms of both performance and environmental perspective, R1224yd and R1233zd could substitute for R245fa as working fluids for heat pump systems.

The fifteenth paper, written by Dharmanto, S. Supriadi and A.S. Baskoro, designs and builds a plasma atomizer with low-cost equipment as a solution to the high cost of plasma atomization. The authors show that the plasma atomizer successfully synthesized the spherical metal powder using an energy source of less than 3 kVA. The authors make a visualization using digital microscope images and SEM. The average produced particle diameter in their study was approximately 82.6 μm, making the powder ideal for biomedical applications.

The sixteenth paper, written by K.L. Hapsari, F. Tharifa, S.S. Moersidik, S. Adityosulindro and C.R. Priadi, analyzes the effect of the addition of Mg on Na toxicity in anaerobic waste treatment and evaluates the parameters of volatile solids destruction (VSD) and chemical oxygen demand (COD) reduction. Their experiment showed that the addition of $MgSO_4$ did not improve the performance of the anaerobic digestion process and the efficiency of COD reduction; however, the addition of a significant amount of $MgSO_4$ caused a significant decrease in VSD value and CH_4 yield.

The seventeenth paper, written by L. Son, K.E. Adipta and M. Bur, evaluates the effects of spring stiffness and the landing gear dimension variation on the nonlinear characteristic and static deflection of the landing gear system. The authors used the CAD simulation model to evaluate the relationship between the mass position and the link angles on the mechanism. They compared the simulation results obtained from the CAD model with those obtained by analytical calculation. They concluded that the stiffness characteristic of the four-bar linkage mechanism landing gear system was nonlinear.

The eighteenth paper, written by M.A. Budiyanto, M.H. Huzaifi and S.J. Sirait, estimates CO_2 emissions at container ports to portray how a port deals with its operational matters, using a model of an ideal condition, assuming that there are no non-ideal activities, and using available equipment. The authors use some input variables, including throughput, transshipment process, transportation modality, and terminal layout. Their study showed that the operational activities of several pieces of equipment can be optimized by comparing the calculation results for actual CO_2 emissions.

The nineteenth paper, written by M.H. Nadhif, A.P. Hadiputra, M.S. Utomo, and Y. Whulanza, designs an affordable conditioned bio-specimen transporter (Conbiport), which uses simpler technology and lower-cost materials. The fabricated Conbiport performed thermal preservation for 120 minutes with the installed battery. The authors' testing showed that PID controller was the most stable of all the configurations, making it the preferable configuration. The authors concluded that Conbiport could be a reliable medium to transport bio-specimens in urban areas.

The twentieth paper, written by W.N. Septiadi, I.G.A.A.D. Wulandari, M.R. Murti, W.A.W. Ula, I.K.O. Widiantara, I.W.D. Widyantara and David Febraldo, investigates the performance of a developed, cascade straight heat pipe (CSHP) used for a better CPU cooling system, which is a fully passive system using nanofluids and hybrid nanofluid as the working fluid. The authors used Al_2O_3-water and Al_2O_3-TiO_2-water as a working fluid. Their study showed that the system with Al_2O_3-TiO_2-water showed the best cooling performance of the CSHP for a CPU cooling system.

We hope that this special edition of IJTech conveys some new insights into the way we conduct our research. We welcome any comments and inquiries you may have regarding the direction and content of IJTech.

With warmest regards from Jakarta,

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