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Efficacy of Quasi Agro Binding Fibre on the Hybrid Composite Used in Advance Application

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Abstract

The choice for natural fibre obtained from agricultural products is on the rise due to its solution to eco-friendly, environmental and improved mechanical properties concerns. Its abundant availability, low cost, emission reduction and adaptability to base material for composite make it a prime material for selection. This review explores diverse perspectives to the future trend of agro fibre in terms of the thermo-mechanical properties as it applies to advanced application in building structures. It is important to investigate the ecofriendliness of the products of composites from fibres in agricultural wastes so as to achieve a green and sustainable environment. This will come to fore by the combined efforts of both researchers and feedback from building stakeholders.

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References

1. Anyanwu CN, Ibeto CN, Eze IS et al (2013) Present and prospective energy use potentials of selected agricultural wastes in Nigeria. J Renew Sustain Energy 5(3):032703

Google Scholar

 Satyanarayana KG, Arizaga GG, Wypych F (2009) Biodegradable composites based on lignocellulosic fibers—an overview. Prog Polym Sci 34(9):982–1021

Google Scholar

3. Milanese AC, Cioffi MOH, Voorwald HJC (2011) Mechanical behavior of natural fiber composites. Procedia Eng 10:2022–2027

Google Scholar

4. Lau KT, Hung PY, Zhu MH et al (2018) Properties of natural fibre composites for structural engineering applications. Compos B Eng 136:222–233

Google Scholar

5. Teow Y, Asharani PV, Hande MP et al (2011) Health impact and safety of engineered nanomaterials. Chem Commun 47(25):7025–7038

Google Scholar

6. Yang CZ, Yaniger SI, Jordan VC et al (2011) Most plastic products release estrogenic chemicals: a potential health problem that can be solved. Environ Health Perspect 119(7):989–996

Google Scholar

7. Schlagenhauf L, Nüesch F, Wang J (2014) Release of carbon nanotubes from polymer nanocomposites. Fibers 2(2):108–127

Google Scholar

8. VomSaal FS, Akingbemi BT, Belcher SM et al (2007) Chapel Hill bisphenol A expert panel consensus statement: integration of mechanisms, effects in animals and potential to impact human health at current levels of exposure. Reprod Toxicol (Elmsford, NY) 24(2):131

Google Scholar

9. Thakur VK, Thakur MK, Raghavan P et al (2014) Progress in green polymer composites from lignin for multifunctional applications: a review. ACS Sustain Chem Eng 2(5):1072–1092

Google Scholar

10.Gurunathan T, Mohanty S, Nayak SK (2015) A review of the recent developments in biocomposites based on natural fibres and their application perspectives. Compos A Appl Sci Manuf 77:1–25

Google Scholar

11.Bambach MR (2017) Compression strength of natural fibre composite plates and sections of flax, jute and hemp. Thin-Walled Struct 119:103–113

Google Scholar

12.Sanjay MR, Madhu P, Jawaid M et al (2018) Characterization and properties of natural fiber polymer composites: a comprehensive review. J Clean Prod 172:566–581

Google Scholar

13.Shekar HS, Ramachandra M (2018) Green composites: a review. Mater Today Proc 5(1):2518–2526

Google Scholar

14.Obi FO, Ugwuishiwu BO, Nwakaire JN (2016) Agricultural waste concept, generation, utilization and management. Niger J Technol 35(4):957–964

Google Scholar

15.Owanaba DB (2015) Conversion of agricultural wastes into poultry feed for sustainable environment. Doctoral dissertation, Federal University of Technology, Owerri

Google Scholar

16.Sud D, Mahajan G, Kaur MP (2008) Agricultural waste material as potential adsorbent for sequestering heavy metal ions from aqueous solutions—a review. Bioresourcetechnology 99(14):6017–6027

Google Scholar

17.Mohan D, Singh KP (2002) Single-and multi-component adsorption of cadmium and zinc using activated carbon derived from bagasse—an agricultural waste. Water Res 36(9):2304–2318

18.Guo XM, Trably E, Latrille E et al (2010) Hydrogen production from agricultural waste by dark fermentation: a review. Int J Hydrogen Energy 35(19):10660–10673

Google Scholar

19.Hameed BH, Ahmad AA (2009) Batch adsorption of methylene blue from aqueous solution by garlic peel, an agricultural waste biomass. J Hazard Mater 164(2–3):870–875

Google Scholar

20.Namasivayam C, Radhika R, Suba S (2001) Uptake of dyes by a promising locally available agricultural solid waste: coir pith. Waste Manag 21(4):381–387

Google Scholar

21.Tsai WT, Chang CY, Lin MC et al (2001) Adsorption of acid dye onto activated carbons prepared from agricultural waste bagasse by ZnCl₂ activation. Chemosphere 45(1):51–58

Google Scholar

22.Garg UK, Kaur MP, Garg VK et al (2007) Removal of hexavalent chromium from aqueous solution by agricultural waste biomass. J Hazard Mater 140(1–2):60–68

Google Scholar

23.Garg U, Kaur MP, Jawa GK et al (2008) Removal of cadmium (II) from aqueous solutions by adsorption on agricultural waste biomass. J Hazard Mater 154(1–3):1149–1157

24.Yevich R, Logan JA (2003) An assessment of biofuel use and burning of agricultural waste in the developing world. Glob Biogeochem Cycles 17(4)

Google Scholar

25.Macias-Corral M, Samani Z, Hanson A et al (2008) Anaerobic digestion of municipal solid waste and agricultural waste and the effect of codigestion with dairy cow manure. Biores Technol 99(17):8288–8293

Google Scholar

26.Aina OM (2006) Wood waste utilization for energy generation. In: Proceedings of the international conference on renewable energy for developing countries, p 2

Google Scholar

27.Olorunnisola A (2007). Production of fuel briquettes from waste paper and coconut husk admixtures

Google Scholar

28.Oluoti K, Megwai G, Pettersson A et al (2014) Nigerian wood waste: a dependable and renewable fuel option for power production. World J Eng Technol 2:234–248

Google Scholar

29.Soleimani M, Kaghazchi T (2008) Adsorption of gold ions from industrial wastewater using activated carbon derived from hard shell of apricot stones—an agricultural waste. Biores Technol 99(13):5374–5383

30.Summerscales J, Dissanayake N, Virk A et al (2010) A review of bast fibres and their composites. Part 2—composites. Compos A Appl Sci Manuf 41(10):1336–1344

Google Scholar

31.Hong CK, Wool RP (2005) Development of a bio-based composite material from soybean oil and keratin fibers. J Appl Polym Sci 95(6):1524–1538

Google Scholar

32.Yahya MA, Al-Qodah Z, Ngah CZ (2015) Agricultural bio-waste materials as potential sustainable precursors used for activated carbon production: a review. Renew Sustain Energy Rev 46:218–235

Google Scholar

33.Saeed MA, Medina CH, Andrews GE et al (2015) Agricultural waste pulverised biomass: MEC and flame speeds. J Loss Prev Process Ind 36:308–317

Google Scholar

34.Neugebauer M, Sołowiej P, Piechocki J (2014) Fuzzy control for the process of heat removal during the composting of agricultural waste. J Mater Cycles Waste Manage 16(2):291–297

Google Scholar

35.Simonyan KJ, Fasina O (2013) Biomass resources and bioenergy potentials in Nigeria. Afr J Agric Res 8(40):4975–4989

36.Oladeji JT (2010) Fuel characterization of briquettes produced from corncob and rice husk resides. Pac J Sci Technol 11(1):101–106

Google Scholar

37.Saba N, Jawaid M, Alothman OY et al (2016) A review on dynamic mechanical properties of natural fibre reinforced polymer composites. Constr Build Mater 106:149–159

Google Scholar

38.Cruz J, Fangueiro R (2016) Surface modification of natural fibers: a review. Procedia Eng 155:285–288

Google Scholar

39.Badrinath R, Senthilvelan T (2014) Comparative investigation on mechanical properties of banana and sisal reinforced polymer based composites. Procedia Mater Sci 5:2263–2272

Google Scholar

40.Shailendra P, Shikha A, Singh LB (2012) Natural binding agents in tablet formulation. Int J Pharm Biol Arch 3(3):466–473

Google Scholar

41.Shafigh P, Mahmud HB, Jumaat MZ et al (2014) Agricultural wastes as aggregate in concrete mixtures—a review. Constr Build Mater 53:110–117

Google Scholar

42.Rajesh M, Pitchaimani J (2017) Mechanical properties of natural fiber braided yarn woven composite: comparison with conventional yarn woven composite. J Bionic Eng 14(1):141–150

Google Scholar

43.Saba N, Jawaid M, Alothman OY et al (2016) Recent advances in epoxy resin, natural fiber-reinforced epoxy composites and their applications. J Reinf Plast Compos 35(6):447–470

Google Scholar

44.Faruk O, Bledzki AK, Fink HP et al (2012) Biocomposites reinforced with natural fibers: 2000–2010. Prog Polym Sci 37(11):1552–1596

Google Scholar

45.Mishra S, Mohanty AK, Drzal LT et al (2004) A review on pineapple leaf fibers, sisal fibers and their biocomposites. Macromol Mater Eng 289(11):955–974

Google Scholar

46.Sood M, Dwivedi G (2017) Effect of fiber treatment on flexural properties of natural fiber reinforced composites: a review. Egypt J Pet

Google Scholar

47.Ku H, Wang H, Pattarachaiyakoop N (2011) A review on the tensile properties of natural fiber reinforced polymer composites. Compos B Eng 42(4):856–873

Google Scholar

48.Gopinath A, Kumar MS, Elayaperumal A (2014) Experimental investigations on mechanical properties of jute fiber reinforced composites with polyester and epoxy resin matrices. Procedia Eng 97:2052–2063

49.Chandramohan D, Kumar AJP (2017) Experimental data on the properties of natural fiber particle reinforced polymer composite material. Data in Brief 13:460–468

Google Scholar

50.Fidelis MEA, Pereira TVC, Gomes OD (2013) The effect of fiber morphology on the tensile strength of natural fibers. J Mater Res Technol 2(2):149–157

Google Scholar

51.Elanchezhian C, Ramnath BV, Ramakrishnan G et al (2018) Review on mechanical properties of natural fibercomposites. Mater Today Proc 5(1):1785–1790

Google Scholar

52.Torres JP, Vandi LJ, Veidt M et al (2017) The mechanical properties of natural fibre composite laminates: a statistical study. Compos A Appl Sci Manuf 98:99–104

Google Scholar

53.Dirisu J, Oyedepo S, Fayomi O et al (2019) Ignition time of selected ceiling materials and escape temperature time prediction of fire fighter rescue mission. J Chem Technol Metall 54(1)

Google Scholar

54.Dirisu JO, Asere AA, Oyekunle JA et al (2017) Comparison of the elemental structure and emission characteristics of selected PVC and non PVC ceiling materials available in Nigerian markets. Int J Appl Eng Res 12(23):14755–14758

55.Dirisu JO, Oyedepo SO, Fayomi OSI et al (2018) Effects of emission characteristics on elemental composition of selected PVC ceiling materials. Mater Focus 7(4):566–572

Google Scholar

56.Youngquist JA, English BE, Spelter H et al (1993) Agricultural fibers in composition panels. In: Proceedings of the 27th international particleboard/composite materials symposium. Washington State University, Pullman, WA, pp 30–31

Google Scholar

57.Youngquist JA, Krzysik AM, English BW et al (1996) Agricultural fibers for use in building components. In: Proceedings of the conference on the use of recycled wood and paper in building applications, pp 123–134

Google Scholar

58.Osarenmwinda JO, Nwachukwu JC (2010) Development of composite material from agricultural wastes. Int J Eng Res Afr 3:42–48 (Trans Tech Publications)

Google Scholar

59.Babatunde A (2003) Assessment of the dimensional stability of cementbonded particleboard from post-harvest banana stem residues and sawdust. ASSESSMENT 488:A2

Google Scholar

60.Abdulkareem SA, Adeniyi AG (2017) Production of particle boards using polystyrene and bamboo wastes. Niger J Technol 36(3):788–793

61.Sotannde OA, Oluwadare AO, Ogedoh O et al (2012) Evaluation of cement-bonded particle board produced from Afzelia African a wood residues. J Eng Sci Technol 7(6):732–743

Google Scholar

62.Badejo SO (1988) Effect of flake geometry on properties of cementbonded particleboard from mixed tropical hardwoods. Wood Sci Technol 22(4):357–369

Google Scholar

63.Okuneye PA, Akande SO, Banwo PA (1986) Forestry residues, wood wastes and fibreboard production and possible uses in Nigeria. Agric Wastes 18(3):215–223

Google Scholar

64.Erakhrumen AA, Areghan SE, Ogunleye MB et al (2008) Selected physico-mechanical properties of cement-bonded particleboard made from pine (*Pinuscaribaea* M.) sawdust-coir (*Cocos nucifera* L.) mixture. Sci Res Essay 3(5):197–203

Google Scholar

65.Osarenmwinda JO, Nwachukwu JC (2007) Effect of particle size on some properties of rice husk particleboard. Adv Mater Res 18:43–48 (Trans Tech Publications)

Google Scholar

66.Babatunde A (2011) Durability characteristics of cement-bonded particleboards manufactured from maize stalk residue. J For Res 22(1):111–115

67.Pinto J, Paiva A, Varum H et al (2011) Corn's cob as a potential ecological thermal insulation material. Energy Build 43(8):1985–1990

Google Scholar

68.Akinyemi AB, Afolayan JO, Oluwatobi EO (2016) Some properties of composite corn cob and sawdust particle boards. Constr Build Mater 127:436–441

Google Scholar

69.Khazaeian A, Ashori A, Dizaj MY (2015) Suitability of sorghum stalk fibers for production of particleboard. Carbohyd Polym 120:15–21

Google Scholar

70.Olorunnisola AO, Adefisan OO (2002) Trial production and testing of cement-bonded particles board from rattan furniture waste

Google Scholar

71.Ndububa EE, Nwobodo DC, Okeh IM (2015) Mechanical strength of particleboard produced from Fonio Husk with gum Arabic resin adhesive as binder. Int J Eng Res Appl 5(4):29–33

Google Scholar

72.Kosmatka SH, Kerkhoff B, Panarese WC (2002) Design and control of concrete mixtures, Portland cement association. Skokie, Illinois, USA

Google Scholar

73.Wang X, Taylor P, Yurdakul E et al (2018) An innovative approach to concrete mixture proportioning. ACI Mater J 115(5)

74.Pickering KL, Efendy MA, Le TM (2016) A review of recent developments in natural fibre composites and their mechanical performance. Compos A Appl Sci Manuf 83:98–112

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75.<u>https://www.afsuter.com/application/binding-agents/Binding</u>. Agents— Shellac, Waxes, Natural Gums, Resins, Menthol Crystals & Zein 2/5/2019

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