Experimental Research of Silane Treatment on Bamboo and Aramid Hybrid Composites

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Abstract: The first and most significant target was to make composite exploiting aramid grit alongside common grit by surface change and acquire combination that has aggressive possessions by diminishing its aramid content as it is costly and its utilization causes carcinogenic though characteristic strands are eco-accommodating just as copiously accessible and its least expensive as well.

Keywords: Bio-degradable, Nano-Bio Interface, Bio compounds.

I. INTRODUCTION

Bio compounds are compound materials, that is, materials shaped by a network (tar) and a support of common strands (normally got from plants or cellulose) [1-3]. Bio compounds are the blend of regular strands (bio grits, for example, wood filaments (hardwood and softwood) or non - wood strands with polymer frameworks from both of the inexhaustible and nonrenewable assets [4-6].

Bio compounds regularly impersonate the structures of the living materials associated with the procedure, notwithstanding the reinforcing properties of the framework that was utilized, yet at the same time giving biocompatibility, for example in making frameworks in bone tissue building [7-10]. The level of biodegradability in bio - put together polymers depends with respect to their structure and their administration condition [11-13].

Compounds are those materials that contain at least two unmistakable constituent stages, on a scale bigger than the nuclear [14-17]. The term 'Bio compounds' alludes to those compounds that can be utilized in bioengineering. The constituents of the compound hold their personalities in the compound [18-21]. Specifically, they don't break down or generally consolidate totally into one another in spite of the fact that they demonstration in show. In compounds, properties, for example, the versatile modulus can be altogether not quite the same as those of the constituents alone, yet are extensively adjusted by the constituent structures and substance [22-25].

From a basic perspective, compounds are anisotropic in nature. Further, investigation into organic inorganic interfaces centers around the plan, blend, and portrayal of novel amalgams that circuit natural and inorganic materials [26-29]. The combination of "delicate" natural and natural atomic congregations with "hard" inorganic nano-structures is of uncommon intrigue as a result of the chance to join typically dissimilar substance and physical properties inside a solitary framework [30-33].

Soluble base treated alongside Silane preserved and unprocessed filaments crossover compound was readied and every one of the kinds of physical and concoction properties examined [44-50]. Compound change utilizing Silane as a coupling operator shows better improvement in properties of both Bamboo/Aramid Hybrid compound just as in Aramid Compound moreover. All the Silane treated compound demonstrated preferred execution over untreated compound [34].

Execution properties of compound having different application in substantial and non material. Silane has an additional bit of leeway both physical and synthetic properties improvement. Diverse grit adjustment procedures can be exploited to recover its mechanical just as synthetic possessions [35]. Different regular strands which are bio degradable and plentifully accessible can be make use of as fortification material with man made filaments with diverse breeds of thermoset and thermoplastic saps [51-54]. Composite framed can be used for basic applications, for making guard of vehicles and internal framing of vehicles and dashboards [36-38].

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II. Experimental Methods

**Chopped bamboo and aramid fibre is treated with distilled water for 24 hrs to remove surface impurities**

**NaOH Treatment**
Treated with 5% NaOH (on weight of fibres) at a temperature 50°C for 1 hour.
Washed multiple times to remove remaining sodium hydroxide. After washing, treated fibres were neutralized with acetic acid to get a final pH of 7 and dried at temperature 80°C for 6 hours.

**Silane Treatment**
This NaOH treated bamboo and aramid fibres were subsequently treated with 5\% (on weight of fibre) 3 amino propyl triethoxy silane which was made in ethanol.
water mixture in the ratio of 80:20. This was followed by curing at 110°C in hot air oven for 60 minutes.

**Fig 1 Surface modification of Bamboo and Aramid Fibre [39-41]**

**Fig 2 Mould and compound specimen preparation [42-44]**

**Fig 3 Silane Preserved of Bamboo & Aramid hybrid Compounds.**
III. RESULT AND DISCUSSION

Fig 4 Silane Un Preserved of Bamboo & Aramid hybrid Compounds.

Fig 4 Effect of Silane Treatment on Tensile modulus of Bamboo: Aramid hybrid Compounds.
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Fig 5 Effect of Silane Treatment on Flexural Strength of Bamboo: Aramid hybrid Compounds

Fig 6 Effect of Silane Treatment on Izod Impact Strength of Bamboo: Aramid hybrid Compounds

Fig 7 Effect of Silane Treatment on Hardness of Treated and Untreated Bamboo: Aramid hybrid Compounds
IV. CONCLUSION

Biocompounds offer open doors for ecological increases, diminished vitality utilization, protection and sound retention properties. These days, Use of Biocompounds in structure ingredients offers a few points of interest, for example, shabby, lightweight, natural neighborly, bio- inexhaustible, and increasingly solid. In any case, they have a few weaknesses also, for example, dampness ingestion and photochemical corrosion in view of the UV contaminations. Moreover, biocompounds offer open doors for natural additions, decreased vitality utilization, protection and sound ingestion possessions biocompounds, their focal points, restrictions, their worldwide generation, and their monetary. Moreover, this paper displayed at this juncture is extremely valuable accumulation of the cutting edge papers comprises a precious springboard to making biocompound advancements of tomorrow.

REFERENCES

1. Murali, B., B. Vijayaraman and D Chandra Mohan., Free Vibrational Analysis of Cortical / Hard Cancellous Bone By Using of FEA, Materials Today: Proceedings Volume 16, Part 2, 2019, Pages 883-888 https://doi.org/10.1016/j.matpr.2019.05.173

2. Dhanashekar M, Senthil Kumar V S, S. Karthikeyan, “Experimental Investigation on LM25 Alloy Reinforced with SiC, Gr and MOA Particles”, Materials in Tehnolgiej / Materials and Technology, vol. 53, no.3, pp. 395-398, 2019. doi:10.17227/mit.2018.038

3. Dhanashekar M, Senthil Kumar V S, “Effect of Solution Heat Treatment and Artificial aging on Tensile Behaviour of A356 alloy” Materials Science – Medijiagoty, vol.25, no.3, pp. 281-285, 2019. http://dx.doi.org/10.5755/jf.ms.25.3.20442

4. V. S. Senthil Kumar, M. Dhanashekar, S. Karthikeyan, “Investigation of process parameters on dry sliding wear of self-lubricating metal matrix composites” in ASME-International Mechanical Engineering Congress Exposition, vol.12, Materials: Genetics to structures : V012T11A010, 2018, doi:10.1115/IMECE2018-86248

5. M. Dhanashekar, V.S. Senthil Kumar, “Tribological behaviour of squeeze cast Al-Si7Mg/SiC/GR hybrid composites”, Journal of the Balkan Tribological Association, 24 (1):106-121, January 2018.

6. S. Prakash, M. Prabath, M. Dhanashekar, V. S. Senthil Kumar, “Open Hole Tensile Behaviour of Nano Fillers (SiC & Banana) in CNSL/Epoxy Resin Reinforced with Basalt fiber”, Materials Today: Proceedings 5 (Issue 2, Part 2), pp: 8631–8637, 2018. https://doi.org/10.1016/j.matpr.2017.11.562

7. V. S. Senthil Kumar, M. Dhanashekar, “Effect of artificial aging on mechanical properties and corrosion behaviour of A356 alloy”, in ASME- International Mechanical Engineering Congress Exposition, vol.14, Emerging Technologies: Materials: Genetics to structures; Safety Engineering and Risk analysis: V014T11A024, 2017, doi:10.1115/IMECE2017-72562.

8. Raja Ganesan Prabakaran Vasanthi-Srinivasan, Sengodan Karthi, Muthiah Chellappandian, Athirham Ponsanka, Annamalai Thanigaivel, Sengettavan Senthil-Kumar, Devarajan Chandramohan, Aspergillus flavus (Link) toxins reduces the fitness of dengue vector Aedes aegypti (Linn.) and their non-target toxicity against aquatic predator, Microbial pathogenesis,128,281-287,2019. DOIhttps://doi.org/10.1016/j.micpath.2019.01.014.

9. R.Prasannasivinas and Chandramohan.D., “Analysis of Natural Fiber Reinforced Composite Material for the Helmet Outer shell”, International Journal of current Research, Vol.4,No.3,137-141.2012.

10. B.Murali and Chandramohan.D., “Fabrication of Industrial Safety Helmet by using Hybrid Composite Materials”, Journal of Middle East Applied Science and Technology, 15,584-587,2014.

11. Murali, B., Chandra Mohan, D. Chemical treatment on hemp/polymer composites, Journal of Chemical and Pharmaceutical Research,6(9), pp. 419-423.

12. Pandiyaraj, V., Ravi Kumar, L., Chandramohan, D. Experimental investigation of mechanical properties of GFPR reinforced with cor and flax, International Journal of Mechanical Engineering and Technology,9, pp. 1034-1042,2018.

13. Murali, B., Chandra Mohan, D., Nagoor Vali, S.K., Muthukumarasamy, S., Mohan, A. Mechanical behavior of chemically treated jute/polymer composites, Carbon - Science and Technology,6(1), pp. 330-335.

14. K Gurusami, K et.al.,(2019): A Comparative Study on Surface Strengthening Characterization and Residual Stresses of Dental Alloys using Laser Shock Peening, International Journal of Ambient Energy, DOI: 10.1080/01434705.2019.1614987.

15. Sathish, T., Chandramohan, D. Experimental study and model development for on-line drill wear monitoring system using lab view, International Journal of Recent Technology and Engineering,7(6), 281-286,2019.

16. Sathish, T and Chandramohan, D, Teaching methods and methodologies used in laboratories, International Journal of Recent Technology and Engineering Volume 7, Issue 6, March 2019, Pages 291-293.

17. Chandramohan, D et al. Mechanical, Moisture Absorption, and Abrasion Resistance Properties of Bamboo-Jute-Glass Fiber Composites. Journal of Bio- and Tribo-Corrosion (2019) 5:66. DOI: https://doi.org/10.1007/s40735-019-0259-z

18. Chandramohan, D., Bharanichandar, J., Karthikeyan, P., Vijayan, R., Murali, B. Progress of biomaterials in the field of orthopaedics, American Journal of Applied Sciences, 11 (4),623-630,2014.

19. Chandramohan, D. and Marimuthu, K., Natural fibre reinforced composite material for bone implant, European Journal of Scientific Research, Vol.54, No.3,384-406,2011.

20. Chandramohan, D, et al., “Applications of CT/CAD/RPT in the Futuretistic Development of Orthopaedics and Fabrication of Plate and Screw Material from Natural Fibre Particle Reinforced Composites for Humerus Bone Fixation – A Future Dril”, Malaysian Journal of Educational Technology, Vol.10,No.12,73-81,2010.

21. Chandramohan, D and John Presin Kumar A. fibre reinforced composites: A promising material for artificial limp. Data-Enabled Discovery and Applications. 1-9, 2017. DOI: https://doi.org/10.1007/s40729-017-0010-1

22. Chandramohan, D., Bharanichandar, J, Impact test on natural fiber reinforced polymer composite materials, Carbon - Science and Technology,5(3), pp. 314-320,2013.

23. Chandramohan, D., Murali, B., Machining of composites - A review, Academic Journal of Manufacturing Engineering,12(3), 67-71,2014.

24. Chandramohan.D., Analysis On Natural Fiber Bone Plates”, European Journal of Experimental Biology, 4(2):323-332,2014.

25. Chandramohan, D., Rajesh, S,Study of machining parameters on natural fiber particle reinforced polymer composite material, Academic Journal of Manufacturing Engineering12(3),72-77,2014.

26. S. Dinesh Kumar, D. Chandramohan, K. Purushothaman and T. Sathish, “Optimal Hydraulic And Thermal Constrains For Plate Heat Exchanger Using Multi Objective Wale Optimization”, Materials Today Proceedings, Elsevier Publisher, Accepted, 2019. DOI : 10.1016/j.matpr.2019.07.710.

27. Chandramohan, D., Marimuthu, K. Applications of natural fibre composites for replacement of orthopaedic alloys, Proceedings of the International Conference on Nanoscience, Engineering and Technology, 6167942, pp. 137-145,2011.

28. Chandramohan, D., Rajesh, S, Increasing combusting resistance for Hybrid composites, International Journal of Applied Engineering Research,9(20), 6979-6985,2014.

29. Chandramohan, D. and Marimuthu, K., “Contribution of Biomaterials to Orthopaedics as Bone Implants – A Review”, International Journal of Materials Science, Vol.5, No.3,445-463,2011.

30. Chandramohan, D., and A.Senthilathan, Effects of chemical treatment on jute fiber reinforced composites, International Journal of Applied Chemistry, 10 (1),153-162,2014.

31. S.Dinesh kumar and K. Purushothaman (2018): Enhancement of thermal conductivity in a plate heat exchanger by using nano particles CNT, AI2O3,surfactant with De-ionised water as coolant, International Journal of Ambient Energy, DOI10.1080/01434705.2018.1562979.

32. Chandramohan, D., Bharanichandar, J. Natural fibre reinforced polymer composites for automobile accessories, American Journal of Environmental Sciences,9(6), 494-504,2014.
Sathish, T., Periyasamy, P., Chandramohan, D., Nagaboothsham, N., Modelling K-nearest neighbour technique for the parameter prediction of cryogenic treated tool in surface roughness minimization, International Journal of Mechanical and Production Engineering Research and Development, 2018, Issue Special Issue, 2018, Article number IMPERDSPL201883, Pages 705-710.

S. Chandramohan, K. Muthukumar and S. Karthick, Natural inspiration technique for the parameter optimization of A-GTAW welding of naval steel, Available online 10 August 2019. https://doi.org/10.1016/j.matpr.2019.05.154.

37. Sathish, T., Jayaprakash, J., "Multi period disassembly-to-order problem of end-of-life products using adaptive genetic algorithm", International Journal of Mechanical and Mechatronics Engineering, vol. 15, no. 3, pp. 59-67, 2015.

38. Sathish, T., "Performance measurement on extracted bio-diesel from waste plastic", Journal of Applied Fluid Mechanics, vol. 10, No. Special Issue, pp. 41-50, 2017.

39. Sathish, T., Jayaprakash, J., "Multi period disassembly-to-order of end-of-life product based on scheduling to maximise the profit in reverse logistic operation", International Journal of Logistics Systems and Management, vol. 26, no. 3, pp. 402-419, 2017.

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