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Review Report on Coconut Fibre based Composite Material

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ABSTRACT

This paper highlights the importance of coconut shells in composite materials in manufacturing strong and eco-friendly materials for construction. Coconut shell and coir fibres are natural materials which are abundantly available in tropical region. Waste generated by industrial and agricultural process has created disposal and management problems which pose serious challenges to efforts towards environmental conservation. Considerable amount of coconut shell and fibres remain in the environment as waste, so utilization of these materials for construction will be an important step to improve sustainability and eco-friendly construction. In addition to that it will help to produce light weight and economically profitable materials in construction field. The current study examined that the use of coconut shell and coir fibre in concrete then increase compressive strength, split tensile strength and flexural strength water absorption.

KEYWORDS: *Image Processing, Electronic invoicing, pdftotext, tesseract, tesseract4.*

I. Introduction

The field of composite materials has progressed considerably over the last few decades. Properties like low density, high strength and stiffness, chemical and corrosion resistance, etc. make composite materials an attractive alternative to metals and alloys. The abundant availability of natural fibre gives attention on the development of natural fibre composites primarily to explore value-added application avenues. Reinforcement with natural fiber in composites has recently gained attention due to low cost, easy availability, low density, acceptable specific properties, ease of separation, enhanced energy recovery [1-5].Natural fibers such as ramie, hemp, jute, sisal, bamboo, banana, oil palm fibers, etc. are used as reinforcements in place of glass fibers. Composite mechanical properties are improved with the increase in fiber weight fraction. But when the fiber weight fraction is too large, the composite fiber bundle strength and ultimate strength gets reduced. Also it depends on the way in which the fibers are aligned with matrix. Coir fibers are used as reinforcement in this work, as it is non-toxic, low cost, high lignin content, low density, easy availability and less tool wear. The studies revealed that fiber weight fractions have significant effects on mechanical properties of composite such as strength, stiffness and toughness. Hence the objective of this work is to investigate the mechanical properties of coir fiber reinforced composites with different weight fraction of fiber.

II. Natural Fibres

A Natural fiber made from plant, animal or mineral sources, and is classified according to the origin. Plants that produce natural fibers are categorized into primary and secondary depending on the utilization. Primary plants are grown for their fibers (examples, Jute, hemp, kenaf, and sisal) while secondary plants are plants where the fibers are extracted from the waste product (examples, Pineapple, Bagasse, oil palm and coir).There are six major types of fibers namely; bast fibers (jute, flax, hemp, ramie, baggase, linen, bamboo, and kenaf), leaves fibers (abaca, banana, sisal and pineapple), leaflets (palm, coconut, etc.) seed fibers (coir, cotton and kapok), grass and reed fibers (wheat, corn and rice) and all other types (wood and roots).

Figure 1. Natural Fibres

III. Coconut Shell

Coconut is a member of the palm family, which is one of the food crops in the world. It generates large amounts of waste material, namely coconut shell (CS). CS is non-food part of coconut which is one of the hard ligno cellulosic agro wastes. Agro waste products such as CS are an annual increase every year and are available in abundant volume throughout the world10. Particularly CS is one of the most significant natural fillers produced in tropical countries like India, Malaysia, Indonesia, Thailand and Srilanka. Several workers have been dedicated to use of other natural fiber in composite in the latest post and CS fiber is a potential candidate for the improvement of new composites because of their high strength and modulus properties. Composite fiber cans be used in, the board range of application such as, building material, furniture and fishnets. Coconut fiber is important reinforcement material in fabrication of various types of polymer based composites, due to cost effectiveness, high strength, etc. Presently 90% CS was disposed as waste and either burned in the open air or left Seattle in waste ponds. This way the coconut processing industries waste according to him contributed significantly to CO2 and methane emissions. Based on economic as well as environmental related issues, this effort should be directed worldwide towards coconut management issues i.e. of utilization, storage and disposal. Different avenues of CS utilization are more or less known, but none of them have so far proved to be economically viable or commercially feasible12.The CS agro waste lignocellulosic filler exhibits some admirable properties compared to mineral filler (e.g. Calcium carbonate, kaolin, mica and talc) such as low cost, renewable, high specific strength-to-weight ratio, minimal health hazard, low density, less abrasion to machine, certainly biodegradability and environmental friendly. However, due to the presence of strong polarized hydroxyl groups on the surface of lignocellulosic fillers, the formation of a strong interfacial bonding with Anon polar polymer matrix becomes complex as the hydrogen bonds tend to prevent the wetting of the filler surfaces. As a result, lignocellulosic fillers show poor mechanical properties in polymer composites due to the lack of interfacial adhesion. Alternatively, the interfacial adhesion among filler and matrix can be enhanced by surface modification of filler. Currently there are many methods to promote the interfacial adhesion between the lignocelluloses filler andpolymer matrix, such as alkaline treatment, esterification, and saline treatment, using compatibilizers and treatment with other chemical compound, when appropriate modifications and production procedures applied. CS displays improved mechanical properties such as tensile strength, flexural strength, flexural modulus, hardness and impact strength13.The low density, high cellulose content, and plenty of CS fiber, make them popular in Southeast Asia and other areas for a number of rope, fiber, and textile applications. Other benefits using the fibers of coconut coir include its toughness, low density, low cost and biodegradability. Several different types of bio composites already exist, including those composed of biodegradable plant-based or animal-based natural fibers, such as flax, jute, silk, or wool. When this bio composite material was tested for dimensional stability, it exhibited very low water absorption rates of less than three percent and low thickness swelling of less than one percent. These results have shown that plant-based fibers may be used as reinforcement in a composite system to improve the properties and performance of polymer matrix resins. The better strength and stiffness, in addition to the lower weight of natural fibers can make the composite tiles useful in vehicle plates, some industrial applications and for walls and floors in construction. The bio composite technology tested hybrid composites of rubber wood, coconut shell and woven cotton or polyester textile fabrics. The aim was to discover how reinforcement provided by textile fabrics affects bio composites. Several different hybrid composites were created, with two, three, or four layers of cotton or polyester fabric. The researcher conducted flexural strength, impact strength, water absorption and thickness swelling tests. The flexural strength and flexural modulus of fabric-reinforced hybrid composites improved compared to the control sample. The flexural modulus of composites reinforced with four layers of fabric tended to decrease slightly. The fabric also gives better impact damage tolerance, which increased with layer count. Since the polyester fabric did not adhere well to the rubber wood and coconut shell mixture, it was not as strong as the cotton fabric-reinforced versions. The researchers said that, if its adherence was improved, the polyester hybrid composite's flexural strength and impact properties would likely improve. The hybrid composites reinforced with cotton had better flexural but lower-impact strength than the polyester-reinforced composites. The composites reinforced with both fabric types had lower water absorption and higher values of thickness swelling than the control sample. Coconut shell is low ash content. Conversion of coconut shells into activated carbons which can be used as adsorbents in water purification and municipal effluents would add value to these agricultural commodities, help reduce the cost of waste disposal and provide a potentially cheap alternative to existing commercial carbons.

IV. Literature SURVEY

Lei Wu, Xiangtai Zhang, Jordan Anthony Thorpe, Lin Li, Yang Si (2020) Relatively cheap or at no cost, easily available, renewable agricultural waste has been given a new purpose. Using coconut shells as the raw material, and being obtained from agricultural, industry by-products, or even waste materials were used as carbon resource. Acid etching coconut shells carbon (AC) rendered micro/nanoscale hierarchical structures and made the surface available for further modification. Then, the surface of acidified coconut shell carbon was engineered via mussel inspired chemistry. The polydopamine functionalized AC composites (AC-PDA) were applied for efficient removal of methylene blue (MB) dye. Further, the surface morphology, and chemical structure were evaluated by means of scanning electron microscope (SEM) and Fourier transform infrared spectroscopy (FT-IR). Through the combination of acid etching and mussel inspired chemistry, organic functional groups can be successfully introduced onto the surface of the coconut shells carbon. The improvement of adsorption capacity of AC-PDA compared with AC is probably due to the increased number of active binding sites resulting from surface modification and formation of new functional groups. In summary, a facile strategy for the surface modification of accessible, and cheap coconut shell carbon to achieve high adsorption of MB has been developed. Acid etching together with mussel inspired chemistry was applied to modify coconut shell carbon, and rendered this a novel absorbent for hierarchical structures with excellent absorption efficiency in boarder MB concentration ranges and fast equilibrium time. This strategy could be easily extended for fabrication of many other high efficiency, low-cost adsorbents. Moreover, this research offers another prospective to the application of mussel inspired chemistry in the environment with no potential side effects of the residual absorbents in water.

Murthi Palanisamy a, Poongodi Kolandasamy a, Paul Awoyerab,∗, Ravindran Gobinatha, Sivaraja Muthusamyc , Thirumalai Raja Krishnasamy d, Amelec Viloriae (2020) Liquid substance intrusion into concrete is one of the issues that gradually damage its physical and structural integrity. The permeability properties of lightweight self-consolidating concrete containing coconut shell aggregate were investigated in this study. A partial replacement of crushed rock (granite) with coconut shell from 0 to 100% in step of 25% was considered for the mixtures. Rice husk ash (RHA) and Silica fume (SF) were considered for developing binary and ternary blended self-consolidating concrete with total powder content of 450 kg/m3 and 550 kg/m3. The testing of concrete involved the saturated water absorption, sorptivity and chloride ingress, which were used to examine the permeability properties of the concrete developed. The laboratory investigations showed encouraging results with better performance up to 75% replacement of crushed granite with coconut shell aggregate. Incorporating CSA as aggregate satisfied the workability requirements for SCC and hence, the CSA based LWSCC mixes are good in fluidity, deformability, passing ability and filling ability. • At 75% and 100% levels of CSA substitution, the density of RHA based binary blended SCC decreased to 1825 kg/m3 and 1740 kg/m3 respectively and in the case of RHA and SF based ternary blended concrete, the density of SCC decreased to 1845 kg/m3 and 1775 kg/m3 respectively and considered as structural light weight concrete. • The compressive strength for 75% CSA in 28 days was observed more than 21.72 MPa which is quite above the strength requirements for structural lightweight concrete. • 75% CSA based ternary blended LWSCC had shown the lower SWA values than that of binary blended SCC with 0% replacement level during the same curing time due to formation of dense paste. • 28 days cured ternary blended LWSCC with 75% CSA had also shown lesser sorptivity because of the impermeable nature of blended concrete.Less than 1% chloride concentration values were detected in all the 90 days cured ternary blended specimens of both the mixes in all the substitution level of CSA. • The ternary blended LWSCC with 75% CSA has lower chloride concentration at 25mm depth from surface than binary blended SCC with 0% replacement level.

E.H. Sujiono a,* , Zurnansyah a , D. Zabrian a , M.Y. Dahlan a , B.D. Amin a , Samnur b , J. Agus c (2020) Graphene oxide (GO) based on coconut shell waste was successfully synthesized using a modified Hummers method, and the obtained GO was confirmed using XRD, FTIR, Raman spectroscopy, UV-Vis spectroscopy, and SEM-EDX. The XRD spectroscopy obtained the fractional content of the 2H graphite phase of 71.53%, 14.47% phosphorus, 10.02% calcium, and 3.97% potassium in coconut shell charcoal, where the GO sample tend to forms a phase of reduced graphene oxide (rGO). FTIR spectra shows compound functional groups of hydroxyl (- OH) at peak 1 (3449.92 cm1), carboxyl (-COOH) at peak 2 (1719.42 cm1) and peak 3 (1702.62 cm1), and alcohol (C–OH) at peak 4 (1628.12 cm1) and epoxy (CO) at peak 5 (1158.51 cm1), which is similar to the GO synthesis from pure graphite. Raman spectroscopy analysis shows that the value of the ID/IG intensity ratio of the GO sample was 0.89 with a 2D single layer, and SEM results showed that surface morphology with an abundance of granular particles were found with different size distribution. The UV-visible results showed sufficient optical properties characterized by the spectrum, which formed because of the light absorption of the energy passed on the sample. The band gap energy value of the sample obtained by the Tauc plot method was 4.38 eV, which indicates semiconductor properties. AGO material has was successfully synthesized from coconut shell waste by a modified Hummers methods. The XRD results showed that 71.53% of graphite 2H observed with GO sample tended to form a rGO phase. FTIR spectroscopy confirmed the appearance of various oxygen containng functional groups such as hydroxyl, carboxyl, alcohol, epoxy within the GO structure. The value of the ID/IG in density ratio of the GO sample was 0.89 with a 2D single layer and had a surface morphology with an abundance of granular particles with different size distributions. The analysis using the Tauc plot method shows that the value of the GO band gap energy was 4.38 eV, indicating its semiconductor properties.

G.Pennarasia S.Soumyaa and K. Gunasekarana (2019) coconut shell aggregate concrete paver blocks were produced and tested for the parameters suggested in IS 15658: 2006. The conventional mix practiced in the field was adopted for the production of coconut shell aggregate concrete paver blocks. For comparison purposes, conventional aggregate concrete paver blocks were produced and tested in parallel. Test parameters such as workability of mixes, density of mixes, dimensions of paver blocks such as length, breadth, thickness and aspect ratio, compressive strength, water absorption, and abrasion resistance results were discussed and presented. Totally 86 paver blocks were produced, 43 paver blocks using conventional concrete mix and 43 paver blocks using coconut shell aggregate concrete mix respectively. As suggested in IS 15658: 2006, 8 paver blocks were randomly selected at each ages (3 days, 7 days, 14 days and 28 days for compressive strength) and tested for each parameter studies except for water absorption for which 3 paver blocks were used. Test results and performance of coconut shell aggregate concrete paver blocks encourage the use of coconut shell as an aggregate for the replacement of conventional aggregate in paver blocks production. In this study, there is an established type of concrete in which coconut shell is used as coarse aggregate in place of conventional coarse aggregate. Starting from the physical, chemical and mechanical properties of coconut shell, production of coconut shell concrete, fresh and hardened mechanical and bond properties, beam elements behavior under flexure, shear and torsion, plastic shrinkage characteristics and durability properties of coconut shell concrete were reported in the past publications [20-27]. Therefore to form another track for research on coconut shell concrete, already a study was made and produced a kind of coconut shell concrete pipe [27] and hence in this study, an attempt was made to produce paver blocks using coconut shell as coarse aggregate and report the essential properties. Both conventional concrete and coconut shell aggregate concrete paver blocks were produced and tested for their respective workability of concrete mixes, density of concrete mixes, dimensions of paver blocks such as length, breadth, thickness and aspect ratio, compressive strength, water absorption, and abrasion resistance test in accordance with IS 15658:2006. Based on the results obtained, the following conclusions were made. Though, both conventional concrete and coconut shell aggregate concrete mixes gave zero slumps and these concretes were found to be good enough for the production of paver blocks, individual rubber moulds were used for cast the paver blocks and also major table vibrators were used for compaction of concrete mixes. Coconut shell aggregate concrete paver blocks are light in weight of approximately 20 % (19.55 %) less compared to conventional concrete paver blocks and coconut shell aggregate concrete paver blocks have shown 100 % good results compared with conventional concrete paver blocks in all dimensional properties. As per the compressive strength test results which are ranging from 30 N/mm2 to 55 N/mm2 , are required and can be stated that the conventional concrete paver blocks and coconut shell aggregate concrete paver blocks produced in this study can be recommended to use in the places subjected to heavy traffic category and medium traffic categories conditions respectively. Water absorptions of conventional concrete (3.112%) and coconut shell aggregate concrete paver blocks (2.23%) are well within the allowable limits (6%) of the standard IS 15658: 2006. Coconut shell aggregate concrete paver blocks have 33 % more abrasion resistance compared to conventional concrete paver blocks. Over all, coconut shell can be used as an alternate for the conventional coarse aggregate in the production of paver blocks also.

K.D.M.S.P.K. Kumarasinghea,b , G.R.A. Kumaraa, , R.M.G. Rajapakseb,c , D.N. Liyanagea,b , K. Tennakone (2019) Dye-sensitized solar cells are mainly focus on fabricating low-cost cell with high performances. Cost of dye-sensitized solar cells depends mainly on the counter electrode material where the best catalyst for triiodide reduction at the counter electrode is platinum, which is highly expensive. Among various non-platinum counter electrode catalysts, carbon-based materials stand out to be the best alternative as far as low-cost and ready abundance are concerned. A simple procedure is described for producing high electrical conductivity activated charcoal from coconut shells and depositing it on conducting tin oxide glass as a thin film, to be used as the counter electrode for dye-sensitized electrolytic solar cells. The activated coconut shell charcoal catalytic layer which is subjected to this work had very good adhesion between the particles as well as to the conducting tin oxide glass substrate. The efficiency of 7.85% obtained exceeds, values obtained from other forms of activated carbon derived from bio-materials. A method has been developed to produce highly conducting activated coconut charcoal and deposit on conducting tin oxide glass to fabricate a counter electrode for a dye-sensitized solar cell. The efficiency obtained is highest reported for CE based on a natural carbon material. Coconuts shells are readily available and extensively used for manufacture of activated charcoal used in diverse variety of applications. The activation procedures commonly adopted are energy intensive involving several processing steps. Procedure adopted here is relatively simple. Heating the burnt shell in air for 20–30 min at 900 °C, effectively pyrolyse all organic components to carbon, except for introduction surface groups. It is not clear whether surface ligands play any role in electro catalytic activity or adherence of the material to the conducting glass. The absorption band in FTIR at 1741.9 cm−1 seems to originate from C=C stretching of carboxylate. This ligand binds to oxide semiconductors (i.e. SnO_2 in FTO). However, direct evidence for binding of activated charcoal to FTO surface via carboxylate could not be ascertained. CE made from coconut shell charcoal by the method described in this work was found to be superior to best coconut shell and other forms of activated carbon. The reason appears to be high electrical conductivity and good electro catalytic activity towards triiodide reduction.

S.Soumya, G. Pennarasia and K. Gunasekarana (2019) Two sets of manhole cover slabs were cast; one set with conventional concrete and the other set with coconut shell aggregate concrete. In both the cases, in one set 10 mm steel reinforcements were used and in the other sets 12 mm steel reinforcements were used. These manhole covers were produced and tested as per IS 12592: 2002. In both the concrete, along with conventional materials and coconut shell, steel fibers and micro silica were used to reach the specification required for the manhole cover slab. As per IS 12592:2002, a size of 600 × 600 × 100 mm and light duty grade of manhole cover slab were selected and studied. Test parameters such as workability of mixes, density of mixes, settlement limits at test load, crack formation, ultimate load and settlements at ultimate load results were discussed and presented. It is observed that the settlement at the time of test load on both conventional and coconut shell aggregate concrete manhole cover slabs were well within the limit specified by IS 12592: 2002. In both the cases, there was no formation of cracks at the time of sustaining test load as per IS 12592:2002. Load factors against ultimate failure were more than 4 in all the cases and hence, coconut shell aggregate concrete can be used for the production of manhole cover slabs. Test results and performance of coconut shell aggregate concrete manhole cover slabs encourage the use of coconut shell as an aggregate as the replacement of conventional aggregate in the production of manhole covers. There is an established type of concrete in which coconut shell is used as coarse aggregate in place of conventional coarse aggregate. Starting from the physical, chemical and mechanical properties of coconut shell, production of coconut shell concrete, fresh and hardened mechanical and bond properties, beam elements behavior under flexure, shear and torsion, plastic shrinkage characteristics and durability properties of coconut shell concrete were reported in the past publications [20-27]. Since this concrete is the recent establishment in concrete technology and have ample scope for more research, taken effort and done research on coconut shell concrete. Therefore to form another track for research on coconut shell concrete, already a study was taken and produces a kind of coconut shell concrete pipe [27] and hence in this study, an attempt is made to produce manhole cover slabs using coconut shell as a coarse aggregate and studied the essential properties and reported. Both conventional and coconut shell aggregate concrete manhole cover slabs were tested for their strength test, settlement and formation of cracks in accordance with IS: 12592-2002. Based on the results obtained, the following conclusions were made. Mix ratio selected and used in this study for the production of cover slabs can be recommended for manhole cover slabs. Coconut shell aggregate concrete cover slabs have shown good correlations compared with conventional concrete cover slabs in slump (7 mm for CC and 6 mm for CSAC) and compaction factor (0.92 for CC and 0.89 for CSAC). Hardened density of CSAC mix is 18.22 % less compared to the hardened density of CC mix at 28 days. Compressive strength of the CC and CSAC mixes are 40.33 N/mm2 and 35.16 N/mm2 which satisfied the minimum requirement of 30 N/mm2 as per IS: 12592-2002. Settlement at the time of test load on both CC (0.05 & 0.06 mm) and CSAC (0.09 & 0.11 mm), at ultimate load, the settlement of CC (0.10 & 0.14 mm) and CSAC (0.12 & 0.16 mm), manhole cover slabs are well within the limit of 6 mm and also on both CC and CSAC the specimen, no cracks are formed at the time of sustaining test load as specified by IS: 12592 –2002. Load factor against ultimate failure is more than 4 in all the cases, hence it can be concluded that the coconut shell aggregate concrete can be used for the production of manhole cover slab. By doing this the coconut shell can be considered as an alternate material for conventional coarse aggregate and the coconut shell waste landfill can be minimized and will result in resource conservation/environment protection.

LI Wen-yue, WU Shi-yong, WU You-qing,HUANG Sheng, GAO Jin-sheng (2019) To get more insight into the pore structure characterization of nanoporous biomass chars, different probe molecules, models, and calibration steps were used and compared. The coconut shell chars (CSCs) were prepared under a steam atmosphere and characterized using N2, Ar, and CO2 adsorption. The results show that coconut shell chars are suitable for further activation, due to the high carbon content and abundant porosity. Ar adsorption with application of Non-Local Density

Functional Theory (NLDFT) model can more accurately characterize the pore structure of CSC. When the calibration step is performed before adsorption measurement, the important results of N2 and Ar adsorption, such as pores size distribution (PSD) and isotherm, are affected by pore blocking, leading to the erroneous understanding of CSC in special applications. Vacuum treatment at 273 K for 1 h after He calibration is enough to remove He, which could reduce effect of pore blocking. In order to get relatively accurate pore structure characterization of biomass chars, CSCs were selected as the representative sample with narrow microporosity and characterized using different probe molecules, models, and calibration steps. The following conclusions are obtained from this study: The pores in the CSC sample are mainly micropores with slit-shape pore. The NLDFT equation is more suitable for narrow micropores than the BET equation. Due to the absence of interactions of Ar with the char surface, Ar adsorption can provide an excellent description of smaller micropores. CSCs are suitable for further applications as activated carbons due to the high carbon and low ash content. CSCs own high SA and porosity, implying that CSCs require a low amount energy for activation. When He calibration is performed before N2 and Ar adsorption measurement, some He remain adsorbed on narrow micropores after vacuum treatment at 77.4 K, thus blocking the microporosity. Effect of pore blocking on SA could be ignored except for ANLDFT obtained from Ar adsorption. On the contrary, the pore blocking strongly affects the shape of adsorption isotherm in logarithmic scale at low relative pressures and PSD at small pore diameters. When calibration step is performed before adsorption measurement, Ar adsorption with application of NLDFT model can more accurately and conveniently characterize the pore structure of CSC. After calibration step, vacuum treatment at 273 K or higher temperature is enough to remove He used during the calibration step, giving rise to relatively accurate characterization of narrow microporosity. This finding is of special relevance in programming of the software in any automated equipment.

Manjunatha Chary G Ha, K Sabeel Ahmed (2018) Modal analysis comprises of determination of natural frequency, mode shapes and damping factor of dynamic structures. It is essential in analyzing the response of a structure in real-life situations to avoid resonance condition under excitation. Now a days, composites with natural fiber/particle materials are in considerable demand for structural applications as an alternative material to conventional synthetic fiber composites. However, adequate amount of work on modal analysis of these composites has not been noticed in the literature. The objective of the present work is to evaluate the influence of coconut shell particle size and its volume fraction on natural frequencies and damping factor of coconut shell particles filled epoxy composites. Coconut shell particles reinforced composites (CSPE) were developed using open mould technique with particle sizes of 0.25, 0.5,1 and 2mm and particle volume fractions of 40%, 50% and 60%. The experimental set up consists of a composite cantilever beam (270 mm × 40 mm × 12 mm), impact hammer, accelerometer and computer interfaced data acquisition system. Acceleration v/s Time plots were acquired using LAB VIEW virtual instrumentation software and converted into Amplitude v/s Frequency plot by Fast Fourier Transform (FFT) using MAT LAB. The natural frequencies are also predicted theoretically and numerically (using ANSYS). The damping ratio was determined using half power band width method. The results reveal that as the particle size and its volume fraction increases, the natural frequency decreases whereas it is vice versa in case of damping factor. The experimental, theoretical and numerical values of natural frequencies are found to be in good agreement. It is concluded that CSPE composites possesses the damping ratios comparable to conventional composite materials such as glass fibre filled epoxy composite. The natural frequencies and damping ratios of CSPE composites for different particle sizes and particle volume fractions were experimentally determined using LAB VIEW virtual instrumentation software. The experimental results were compared with theoretical and numerical results and are found to being good agreement. Both particle volume fraction and particle size have considerable effect on the vibration parameters. CSPE Composites with 0.25 mm particle size and 40% particle volume fraction(Sample A1) exhibited higher natural frequency and lower damping ratio whereas the CSPE composite with 2 mm particle size and 60% particle volume fraction (Sample D3) showed lower natural frequency and higher damping ratio. Based on the comparison of damping factor made with other types of composites from literature, CSPE composite can be recommended as a suitable damping material for applications in automobile sectors and interiors in aerospace applications.

Apeksha Kanojia, Sarvesh K. Jain (2017) a large amount of waste coconut shell is generated in India from temples and industries of coconut product and its disposal need to be addressed. Researchers have proposed to utilize it as ingredient of concrete. This experimental investigation was aimed to quantify the effects of replacing partially the conventional coarse aggregate by coconut shell to produce concrete. The research work was divided into two parts. First part was aimed to observe the effect of such replacement on compressive strength and density of concrete. In the second part, the aim was to find out the additional quantity of cement required to compensate for reduction in strength of concrete resulted due to this replacement. It was found that with increasing proportion of coconut shells, there is decrement in compressive strength. Results revealed that with 40% replacement of conventional coarse aggregate by coconut shell, 7 days compressive strength of concrete decreased by 62.6%; whereas decrease in 28 days compressive strength was only 21.5%. 40% replacement makes the concrete lighter by 7.47%. Further, it was revealed that for mix design of concrete of 20 N/mm2 characteristic strength, no additional cement is required for 5% replacement and only 3.6% additional cement was required for 10% replacement. The results confirm that although there is an increase in cost due to additional cement requirement, the advantages being many, including efficient utilization of waste coconut shell, reduction in natural source depletion etc, and the use of coconut shell in concrete seems to be a feasible option. Such study will help to arrive at final decision regarding quantity of coconut shell for replacing conventional aggregates in concrete production. Large production of non-decaying waste coconut shell leads to disposal problem. Properties of coconut shell makes it suitable ingredient for concrete production and its use for concrete may help in its disposals problem. Replacement of conventional aggregate by waste coconut shell (keeping quantity of other ingredients unchanged) results into decrease in compressive strength. 40% replacement resulted in about 22% reduction in the 28 days strength. Addition of coconut shell shows low strength development at early age but later it shows rapid strength development. The ratio of 7 days to 28 days strength ranges from 0.87 (for concrete without CS) to 0.42 (for concrete with 40% CS). Replacement of conventional aggregate by waste coconut shell makes the concrete lighter. Reduction in concrete density is about 7.5% for 40% replacement. Strength obtained for conventional concrete can be maintained for waste coconut shell concrete also by reducing the W/C ratio. The required reduction in W/C ratio for achieving same strength is more for increased waste coconut shell contents thereby increasing the cement consumption. No additional cement is required for 5% replacement and only 3.6% additional cement is required for 10% replacement. Although there is an increase in cost due to additional cement requirement, the advantages being many, including efficient utilization of waste coconut shell, reduction in natural source depletion etc, the use of coconut shell in concrete seems to be feasible option.

VI. FUTURE SCOPE AND CONCLUSION

The utilization of coconut shell fibers in various applications has opened up new avenues for both academicians as well as industries to design a sustainable module for future use of coconut shell fibers. Coconut shell fibers have been extensively used in composite industries for socioeconomic empowerment of peoples. The fabrication of coconut shell fibers based composites using different matrixes has developed cost effective and eco-friendly bio composites which directly affecting the market values of coconut shell. To design such composites thorough investigation of fundamental, mechanical, and physical properties of coconut shell fibers is necessary. n this review, we have tried to gather the information about the analysis and testing methods used. However, researcher already done lots of work on coconut shell based composites, but it still required to do more research and innovation in this area to overcome potential challenges ahead. These things will make life easy for both urban as well as rural people who are more depended on synthetic based composites. As regards the commercial situation, it can be stated that the market is still in an opening phase; therefore much can still be done in order finding new applications, improving the properties, the appearance and the marketability of these materials. All of these issues require and continue to require, significant research efforts in order to find new formulations (virgin or recycled polymers, traditional or biodegradable polymers; type, appearance, quality and amount of the fillers), characterize them and apply them for the most suitable applications and in general, to refine processing techniques. As soon as the market for these composites increases, reduction of costs and improvement of the quality will be achieved.

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