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Study of Mechanical Properties of Coconut Shell Powder

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ABSTRACT
The non-food element of a coconut is the shell, which is oneof the tough agricultural wastes Coconut shell holds alotof promise due to its high strength and modulus. Whencomparedtoothermaterials,coconutshellpowderhasexcellentqualities,lowcost,renewable,highspecificstrengthtoweightratio,lowdensity,lowabrasiononmachine, and environmental friendliness are some of thebenefits. Plastics take a long time to disintegrate, pollutingtheenvironment.Tomakecompositematerial,threevariouspercentagesofcoconutshellpowderandepoxyresins are combined and the results are examined for eachof the three composite materials. The input needed to solvethis problem is to reduce the use of plastics by substitutingthem with naturalmaterials. Coconut shell is becomingmorewidelyavailable around the world, yetmostshellsare discarded or burned as waste. Efforts to identify a useforthissubstancehavemostly resultedinlowyields.

I. INTRODUCTION

Compositeshaverecentlymettheoptimalrequirementcriterion formaterialsused by various designers. In recentyears, there have been significant advancements in the designand manufacture of light weight, high strength materials as aresultoftheincreaseduseofpolymercompositematerials.

Several researchers have focused their efforts on defining awide range of combinations of biodegradable matrix/naturalfillerinordertopromotenewclassesofbiodegradablecomposites with improved mechanical properties and low-costproducts. Among the many natural fibers studied in this area,several fillers play a key role. With the increased usage ofwood-based raw materials, for example, the development ofwoodflourcompositeshasreceivedalotofattention.Substitutionswereunavoidablyrequired [1-4].

Natural Fillers (NF) reinforced materials have a number ofenvironmentalbenefits,includingreducedrelianceonnon-renewablematerials,reducedpollution,andreducedgreenhouse gas emissions. Flax, jute, hemp, and other naturallignocellulosefillersareaneco-friendlieralternativetotraditionalreinforcingfibres(glass,carbon)[5-10].

The coconut shell powderisareinforcedmaterialwhichdoesnothaveanypoisonouscontentlikeplastic.Makingofcompositesusing these reinforced materials with additionof additives can be replace theplastics.The main goal is toraise awareness about environmental protection by avoidingchemicalcomposites.Reducethedependenceonproductmadeofplastic [11-13].

BalajiA.KarthikeyanB.,SundarrajiC.Baggasehasinvestigated the use of coconut shell particles as a reinforcingmaterial. In a grinding machine, shell particles ranging in sizefrom200to800micronsarecreated.Becauseoftheirincreased strength and modulus qualities, coconut shell fillersareviablecandidatesforthedevelopmentofnovelcomposites[1].

John D. Venables studied natural fibres are hair-like threadsobtaineddirectlyfromstudiedplants,animals,andmineral sources. Natural fibres, like synthetic fibres, are made up ofpolymers (in this case, biologically produced compounds likecelluloseandprotein),buttheyemergefromthetextilemanufacturingprocessrelativelyundamaged.Someman-made fibres are also made from naturally occurring polymers.[2].

Madakson P.B., Yawas D.S. And Apasi in this experiment,Epoxy resin, hardener, coconut shell powder, and crushed nutshell powderwereused.. To make it easier to remove thespecimen from the mould, a layer of wax was applied to it.Ground nut shell particles and resin were measured and placedin a plastic container, where they were thoroughly mixed toachieveauniformmixture.[3].

PrakashTudustudied theUnsaturatedpolyesterresin,grade“KPR6600”,thecatalystused,MEKP-

methylethylketeneperoxideandcobalt acceleratorweresuppliedbyKEMROCK industries and export limited, Halol. To removeairbubblesfromthemixture,avacuumwasusedfor5minutes.[4].
Salmah H., Koay SC.,andHakimahO. has studied theuseof epoxy resin, hardener, and coconut shell powder. RunchiOrganicLimitedinKanpur,UttarPradesh,India,suppliesepoxyresinmodititeEL301,amediumviscositytherm osettingepoxyresin.Asamatrixmaterial,ithasexcellentadhesiontovariousmaterials,highresistancetochemical and atmospheric attack, high dimensional stability,excellentmechanicalproperties,nontoxicity,andnegligibleshrinkage.[5].
Salleh Z, Islam M.M., and Ku H The coconut shell was driedintheopenairbeforebeinggroundintopowderwithacrushingmachineandsievedinaccordancewithBS1377:1990 requirements. The results of the chemical analysisof coconut shell powder are shown in one table. The chemicalcomposition of the coconut shell was determined using theabsorption spectrometer (AAS)-peckinhelma 2006 model. [6]Theparticle sizeusedwas100micrometres..
TicoaluA.,AravinthanT.,&CardonaFinvestigatethecoconut shell powder used as filler obtained from slip IndiaExporters Erode. It is reported tocontainedlignin,pentosans,cellulose,moisture,ash,solventextractivesanduronicanhydrides.The formulation of CSP/NR composites is givenintable.ThemixingwasdoneonanASTM-D15-627-laboratory two-roll mixing mill that is compliant. The nip gap,mill roll speed ratio, mixing time, and order of constituentaddition were all kept for the sample for all of the composites.[7].
Kumaretal.[8]evaluatethemechanicalpropertiesofpolyester typhafibre in a combination of wood powder andcoconutshell ashwereinvestigated..

Maheswaranetal.[9]characterizedthenaturalfiberreinforcedpolymercomposite.Thispiecewasmadeusingboth chemically untreated coconut and palm fibre with epoxyresinandchemicallytreatedcoconutandpalmfibrewithepoxyresin..
Kumaretal.[10]investigatedonmechanicalpropertiesof CET(CoconutShell,Eggshellpowder,Teakwoodflour)compositematerials.
SrivastavaandMaurya[11]characterizedepoxy-basedcompositedevelopedfrombiowastematerial.Handlayuptechniquewas used to create composites using 10, 20, and30%coconutshellpowder epoxycomposites.
The effect of mixing time on the mechanical properties of anepoxy-fly ash composite was investigated by Pattanaik et al.[12].
Venkatesh [13] investigate the hand layup method was used tocreateandtestcoconutshellpowderreinforcedepoxycomposites with varying percentages of weight fractions ofcoconutshellfordifferentgrainsizes.
Plasticpollutionisdefinedastheaccumulationofplasticobjectsintheenvironmentthatharmswildlifeandhumans.Huma nsproducea largeamount of plastic becauseit is inexpensiveand long-lasting. Furthermore, the chemical structure of mostplasticsmakesthemresistanttomanynaturalbreakdownprocesses,makingthemslowtodisintegrate.Thesetwofact orshavecombinedtomakeplasticpollutionamajorenvironmentalissue.

II. MATERIALS AND METHOD

PreparationofShellPowder

Equipment for crushing and pulverizing that is designed andproduced to provide optimal efficiency to our clients. Thesecrushing and pulverizing machines are used to reduce the sizeof various types of coconut shells and turmeric. For thermo setmoulding powder, a mesh size of 80-100 mesh is appropriate,whereas synthetic resin glues require a mesh size of 230-240mesh.

MixingofBindersandFillerMaterial

Primarily pulverizedorcrushedacoconut shell powder getmixed inMaida (additive) with the gluten to attain compositematerials' properties. The composite material such as (coconutshellpowderandmaidaflour)(coconutshellpowderandmaidaflour).

III. METHOD OF PRODUCTION

CompressionMouldingMachine

The warmed composite material is first deposited in an openchamber in compression moulding. The mould is sealed with atop force or plug member, and pressure is applied to force thecomposite materialinto contactwithallmould areas.

Fig.1CompressionMouldingMachine

Specificationofcompressionmoldingmachine

Table1Specificationofcompressionmolding machine

Minimum OrderQuantity	1Unit
Height	400mm
Make	SSE
ControlFeasting	3to6units/hour
Material	Coconutshellpowder
ManufactureVolume	2200to2500Plates/8hours
Capacity(piecespermin)	1plate/min
Plate Size Range(inch)	4-12
Sizes	9.5 x4.5x2.5
Width	800mm
Length	3000 mm

Testingsamples

Figure2showsthatSampleAconsistof20%coconutshellpowderaddedwith60%ofbinderasMaida.

Fig.2sample(A)20%CSPfilledcomposite

Figure3showsthatSampleAconsistsof30%coconutshellpowder addedwith60%ofbinder asMaida.

Fig.3sample (B)30%ofCSPfilledcomposite

Figure4showsthatSampleAconsistsof40%coconutshellpowder addedwith60%ofbinderasMaida.

Fig.4sample(C)40%ofCSPfilledcomposite

IV. RESULTSANDDISCUSSION

4.1CSPcompositetestingresultsutilizingUTMTable2testingresult ofCSP composite

SI. No	Properties	20% CSP filledComposite(A)	30%CSPfilled Composite(B)	40%CSPfilled Composite(C)
1.	Tensilestrength(Mpa)	19.23	17.05	14.64
2.	Flexuralstrength(Mpa)	83.38	86.45	73.92
3.	Impactstrength(KJ/m^2)	0.20	0.23	0.25

ofcompositescontaining20percentand40percentfillercontent declines linearly, but increases in composites with 30percent filler content. Whencomparedto othercomposites,theflexuralbreakloadof30%CSPFillercompositeiscomparabletothat ofothercomposites.

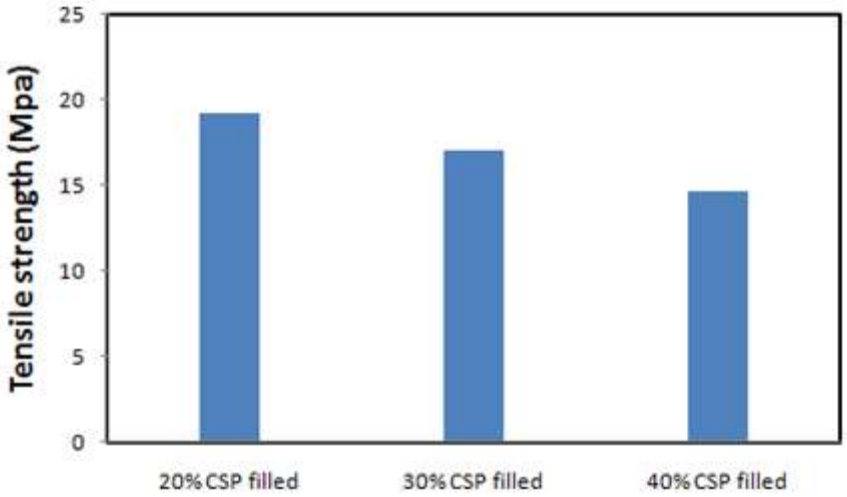

Fig.5TensileStrengthofCSPfilledcomposite

Thetensilestrength of CSPfilledcompositesis oneof themost essential elements, and Fig. 5 depicts the differences intensile strength of composites as a function of filler weightpercentage.Flexuralassetofthe20percentCSPFillercomposite is higher than the rest of the composite. In Fig. 5,the tensile asset of composites with 30 percent and 40 percentfillercontentdeclineslinearlywhilethetensileassetofcompositeswith20percentfillercontentincreases.Whenc ompared to other composites, the tensile break load of 20%CSPFillercompositeiscomparabletothatofothercomposites [14-15].

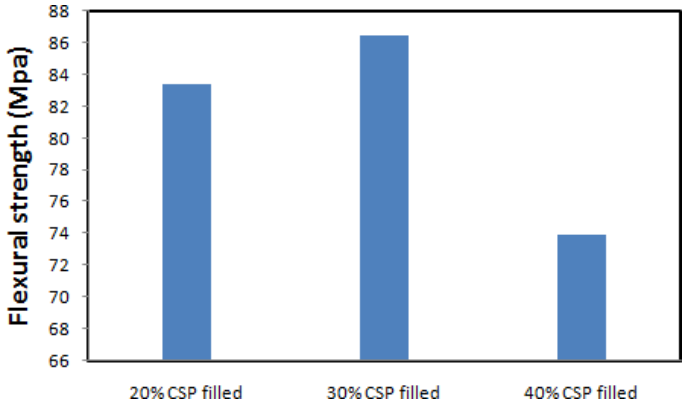

Fig. 6 Flexural Strength of CSP filled composite

FlexuralstrengthisakeyaspectinCSPfilledcomposites,andFig.6portraysthechangesincompositeflexuralassetasafun ctionoffillercontentinweightpercent.Theflexuralstrengthofthe30percentCSPFillercompositeishigherthantherest ofthecomposite.Figure6depicts theflexural strength

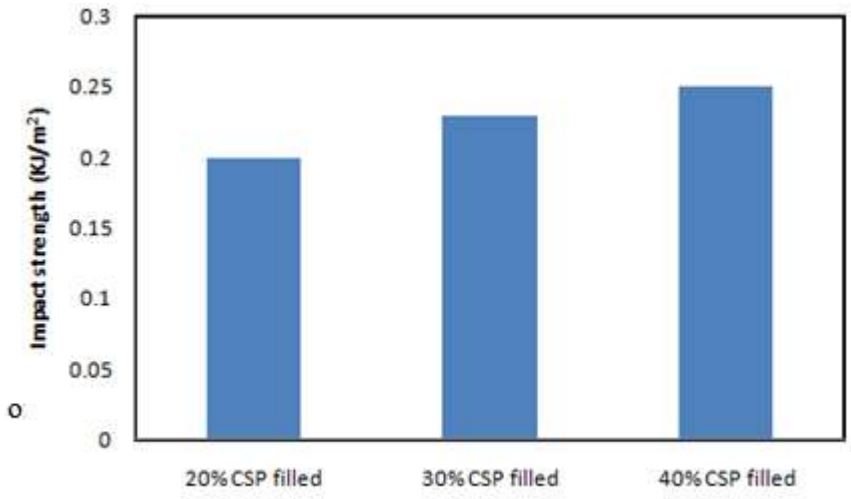

Fig.7ImpactStrengthofCSPfilledcomposite

The impact strength of CSP filled composites is one of themost essential elements, and Fig. 7 depicts the differences inimpactstrengthofcompositesasafunctionoftheweightpercent of filler content. The impact strength of the 40 percentCSPFillercompositeisstrongerthantherestofthecomposite. Figure 7 shows that the impact asset of compositeswith 20% and 30% filler content rises linearly, but the impactstrengthofcompositeswith40%fillercontentincreasesexponentially..Whencomparedtoothercomposites,thei mpact break load of a 40 percent CSP Filler composite iscomparable.

V. CONCLUSIONS

1) Theglobalavailabilityofcoconutshell,ahardlignocelluloses Agrowaste,isincreasing yearafteryear.
2) Themajorityofthetime,coconutshellsarethrownawayorburnedaswaste.
3) The tensile break load of a composite containing 20% CSPFilleriscomparabletothetensilebreakloadofothercomposites.
4) Theflexuralbreak loadof acompositecontaining 30%CSP Filler is comparable to the flexural break load of othercomposites.
5) The impact break load of a composite containing 40% CSPFilleriscomparabletotheimpactbreakloadofothercomposites.
6) Thestudy of coconut shell powder in innumerable applications may lead to the development of new avenues aswell as small-scale industries to design a bearable module forthefutureuse ofcoconutshellpowder tackles.
7) The area CSP plate manufacturing project no just gives apracticalbusinesschancetounemployedyouthadditionencouragesfulfillmentofindependence,evenhandedappr opriationofnaturalpayandadjusted localdevelopment.

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