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Investigation of coconut shell powder over new application

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ABSTRACT

As of 2018, about 380 million tonnes of plastics produced worldwide each year. Around 9% has been recycled and another 12% has been incinerated. Plastics are very slow to degrade and it leads to pollute the environment. The input is required for solving this problem is reducing the usage of plastics by replacing it with a natural one. Availability of coconut shell is increasing worldwide, but mostly the shells are left out in the garbage or burn as waste. Efforts to find utilization of this material have resulted mostly in low value. In this regard, coconut shell powder can be mixed with some binder materials and it can be converted into useful products by moulding process.

Keywords: Availability of coconut shell, Binder material, Moulding process, Reducing plastic usage.

INTRODUCTION

In the latest years, composites fulfill optimal requirement criteria for several designers' materials. In the last years, there have been major developments in the design and fabrication of light weight, high strength materials, primarily due to the increase of polymer composite materials. Several researchers have been aimed at their work towards defining abundant combinations of biodegradable matrix/natural fillers in order to promote new classes of biodegradable composites with enhanced mechanical properties, as well as to attain product with low cost. Among several investigated natural fibers in this area, different fillers have the significant importance. For example, the development of wood flour composites has been actively pursued with the increasing consumption of wood based raw materials. In their substitutions were inevitably needed.

The Natural Fillers (NF) reinforced materials offers several environmental advantages, such as decreased dependence on non-renewable materials sources, lower pollution and green house emission. Natural lignocelluloses fillers (flax, jute, hemp, etc) represent an environmentally friendly alternative to conventional reinforcing fibers (glass, carbon).

OBJECTIVES

The coconut shell powder is a reinforced material which does not have any poisonous content like plastic. Making of composites using this reinforced materials with addition of additives can be replace the plastics. The main objective is to raise the awareness of environment protection by avoiding the chemical composites. Reduce the dependence on product made of plastic.

LITRATURE SURVEY

Balaji A. Karthikeyan B., Sundar raji C. Baggase Coconut shell particles are used a reinforcing material for investigation. Shell

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particles of size between 200-800µm are prepared in grinding machine. Coconut shell fillers are potential candidates for the development of new composites because of their higher strength and modulus properties. An approximate value of coconut shell density is 1.60 g/cm³. Epoxy resin (ER) is the one of the most important classes of thermosetting polymers which is widely used matrices for fiber-reinforced composite materials and as structural adhesives [1].

They are amorphous, highly cross linked polymers and this structure result in these materials processing various desirable properties such as high tensile strength and modulus, uncomplicated processing, good thermal and chemical resistance, and dimensional stability.

John D. Venables Natural fibers are hair-like threads obtained directly from plants, animals, and mineral sources. Botanically, a natural fiber is a collection of cells having long length and negligible diameter. They are obtained as continuous filaments or discrete elongated pieces similar to thread. They can be spun or twisted into yarn such as cloth and can be converted into nonwoven fabrics, such as paper or felt. An example of a commonly used natural fiber is cotton, coconut shell. Other examples include wool, jute, silk, hair, fur, hemp, and linen. Man-made fibres are to be distinguished from natural fibres such as silk, cotton, and wool. Natural fibres also consist of polymers (in this case, biologically produced compounds such as cellulose and protein), but they emerge from the textile manufacturing process in a relatively unaltered state. Some man-made fibres, too, are derived from naturally occurring polymers [2].

Madakson P.B., Yawas D.S. And Apasi A Materials used in this experimental work are epoxy resin, hardener and coconut shell powder, ground nut shell powder. Epoxy resin (grade-VBR8912) is a thermosetting epoxy resin of medium viscosity supplied by GVR Enterprises, Madurai, Tamilnadu and India having outstanding properties as the matrix material, like excellent adhesion to different materials, high resistance to chemical and atmospheric attack, high dimensional stability, excellent mechanical properties, non toxic nature and negligible shrinkage.A mould with the dimension of 300mm×300mm×3mm was used to prepare the composite specimen. A layer of wax was supplied to the mould so that the specimen can be easily taken out of mould. Measured quantities of ground nut shell particles and resin where take in a plastic container and stirred thoroughly to get homogeneous mixture [3].

Prakash Tudu Unsaturated polyester resin, grade "KPR 6600", the catalyst used, MEKP-methyl ethyl ketene peroxide and cobalt accelerator were supplied by KEMROCK industries and export limited, Halol. The coconut shell powder was obtained from VG tinder products LTD Salem. A particle size analyzer was used to obtain an average filter size 80µm. Mixing of the UPR/CSP composite was carried out by casting process. The UPR and requisite amount of filter content where homogeneously mixed by using mechanical stirrer. Accelerator and harder were added in the homogeneous mixture. Vacuum was applied for 5 minutes to remove air bobbles from the mixture [4].

Salmah H., Koay SC., and Hakimah O. Materials used in this experimental work are epoxy resin, hardener and coconut shell powder. Epoxy resin moditite EL301 is a thermosetting epoxy resin of medium viscosity supplied by Runchi Oraganic Limited Kanpur, Uttar Pradesh, India having outstanding properties as the matrix material like excellent adhesion to different material, high resistance to chemical and atmospheric attack, high dimensional stability, excellent mechanical properties, nontoxic nature and negligible shrinkage [5].

Salleh Z, Islam M.M., and Ku H. The coconut shell was dried in open air and grinded into powder using a pulverizing machine, the powder was sieved in according with BS 1377:1990 standards. The result of the chemical analysis of the coconut shell powder show in table in one. The chemical analysis of the coconut shell was done with absorption spectrometer (AAS)-peckinhelma 2006 model. The particle size used was 100µm. The pelletized polyethylene waste was sun-dried and shredded in a plastic crusher machine [6].

Ticoalu A., Aravinthan T., &Cardona F Coconut shell powder (CSP) used as filler obtained from slip India Exporters Erode. It is reported to contained lignin, pentosans, cellulose, moisture, ash, solvent extractives and uronic anhydrides. The

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NR used was Indian Standard Natural Rubber-5, light colour grade (ISNR-5L). All other rubber chemicals were of reagent grade. Sodium hydroxide and potassium permanganate used for fiber surface modification were of reagent frade supplied by Merck. The solvents benzene, toluene and xylene used were laboratory reagent grade supplied Merck.The composites were filled by incorporation of filler in to NR matrix according to base formulation. The formulation of CSP/NR composites is given in table. Mixing was carried out on a laboratory two roll mixing mill according to ASTM-D 15-627. Nip gap, mill roll speed ratio, time of mixing and the sequence of addition of ingredients were kept for the sample for all the composites [7].

PROBLEM IDENTIFICATION

Plastic pollution is the accumulation of plastic objects (e.g.: plastic bottles and much more) in the Earth's environment that adversely affects wildlife, wildlife habitat and humans. Plastics that act as pollutants are categorized into micro-, meso or macro debris, based on size. Plastics are inexpensive and durable, and as a result levels of plastic production by humans are high. Moreover, the chemical structure of most plastics renders them resistant to many natural processes of degradation and as a result they are slow to degrade. Together, these two factors have led to a high prominence of plastic pollution in the environment.

MATERIALS AND METHOD

Preperation of Shell Powder

Crushing & pulverizing equipments that are designed and manufactured to yield maximum efficiency to our clients. These crushing & pulverizing equipments are used for size reducing different types of coconut shell, turmeric. Mesh size of 80-100 is suitable for thermo set moulding powder whereas for synthetic resin glues the size has to be around 230-240 mesh.

Binder Selection

Maida is made from the endosperm and it is developed from the starchy white part of the grain. The bran is separated from the germ and endosperm which is then refined by passing through a sieve of 80 mesh per inch (31 mesh per centimeter). Although naturally yellowish due to pigments present in wheat, maida is typically bleached, either naturally due to atmospheric oxygen, or with any of a number of flour bleaching agents. While it is milled from winter, and wheat that has a high gluten content, heat generated during the milling process results in denaturing of the protein, limiting its use in the preparation of leavened breads

The wheat gluten proteins correspond to the major storage proteins that are deposited in the starchy endosperm cells of the developing grain. Gluten can be readily prepared by gently washing dough under a stream of running water. This removes the bulk of the soluble and particulate matter to leave a proteinaceous mass that retains its cohesiveness on stretching (figure 1a). Gluten comprises some 75% protein on a dry weight basis, with most of the remainder being starch and lipids. Wheat bran flour.

1) water holding capacity- 2.27 to 2.98 $g.g^{-1}$
2) highest swelling capacity –(5.21$ml.g^{-1}$)
3) lowest water retention & oil binding capacity (1.38 and 1.35 $g.g^{-1}$)

Mixing of Binders and Filler Material

Primarily pulverized or crushed an coconut shell powder get mixed in Maida (additive) with the gluten to attain the properties of composite materials. The composite material such as (coconut shell powder and maida flour).

METHOD OF PRODUCTION

Compression Moulding Machine

In Compression moulding the composite material preheated, is first placed in an open cavity. The mould is closed with a top force or plug member, pressure is applied to force the composite material into contact with all mould areas, while are maintained until the moulding material has cured.

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Fig.1 Compression Moulding Machine

Sample with Composite Material

The coconut shell powder and additive material such as "MAIDA FLOUR" mixed in the ratio of 1:0.75 % (such as 1 percentage of coconut shell powder mixed with 0.75 percentage of Maida flour). After that heat treatment process applied over the composite material. Heat treatments are used to make the strong bonding between filler material and additives while during compression moulding process.

Primarily a coconut shell powder had mixed on additive as Maida flour with a gluten .Then the composite material had heated and compressed by heated dies in an compression moulding machine.

Fig. 2 Sample of Coconut Shell Powder

CONCLUSIONS

The availability of coconut shell is increasing every year worldwide, which is hard lignocelluloses Agro waste. But mostly the coconut shells are left out in the garbage or burn as waste. So according to the research about coconut shell powder in various applications will may opened of new avenues as well as small scale industries to design a sustainable module for future use of coconut shell powder utensils. The area CSP plate manufacturing project no just gives a practical business chance to unemployed youth addition encourages fulfillment of independence, evenhanded appropriation of natural pay and adjusted local development.

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