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Safflower Seed Husk Reinforced Plastic (Srp)

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Abstract: **-- As the world becoming more connected and the waste stream is expandng,hence it is the need of our hour to come up with better ways to manufacture and reuse plastic material. It is the matter of fact that particulate filled polymer composites are becoming attractive because of their low cost and wide applications. To determine, the possibility of using agricultural waste material SAFFLOWER SEED HUSK(SSH), as reinforcing fillers in thermo polymer composite (LDPE). *keywords - SAFFLOWER SEED HUSK (SSH), LDPE.**

INTRODUCTION

SAFFLOWER SEED HUSK REINFORCED PLASTIC (SRP) are the composite materials made of safflower seed husk powder and a thermoplastic LDPE (low density polyethylene) without any external reagent or a binder. This work is part of a comprehensive study of the utilization of safflower seed husk(SSH) with potential application in polymer composite fabrication. The objective of the present study, is to investigate the effect of filler in the LDPE polymer and evaluating its mechanical properties viz; compressive strength and water absorption test.

BACKGROUND AND MOTIVATION

Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat and humans as the plastics act as pollutants. The prominence of plastic pollution is correlated with plastics being inexpensive and durable, which lends to many fold uses of plastics by humans. However, it is slow to degrade. Plastic pollution can unfavorably affect lands, waterways and oceans. Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of plastic waste or through exposure to chemicals within plastics that cause interruptions in biological functions. Humans are also affected by plastic pollution, such as through the disruption of the thyroid hormone axis or hormone levels. About 300 million tons of plastic is produced globally each year, only about 10 % of that is recycled. India generates 5.6 million metric tons of the waste plastic annually.

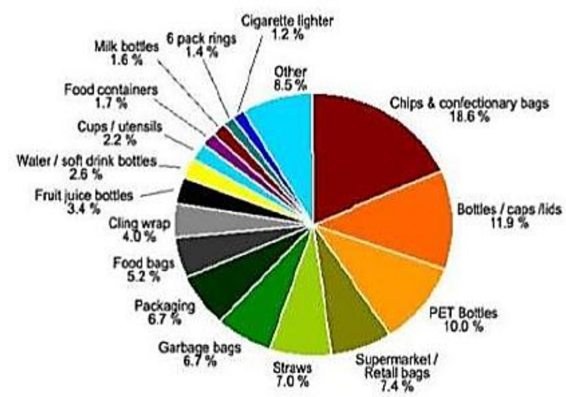

Figure. 1.use of plastic

LITRETURE SURVEY / PREVIOUS WORK

Composites are materials composed of two or more different materials with the properties of the resultant material being superior to the properties of individual material that make up the composites. Hence by definition, blend of agro waste and plastic could be composites. Agro-wastes are byproducts of agricultural produce; it can be husk, straw, cobs or fiber. However, agro waste plastic composites are combination of agro-wastes filled with plastic polymer (virgin or recycled) to obtain a material of superior properties to the single material for multi functional applications. Presently, agro waste plastic composites are prepared based on differences in formulations, filler loading, polymer plastic (virgin or recycled), additive aggregate, process ability techniques, fiber type and required characterizations. These may be used individually or in combination with each other so as to achieve desired structure of agro waste plastic composites. Below are some reinforcement polymers in plastic composites formations.

1) Polyethylene Terephthalate (PETE).
2) High Density Polyethylene (HDPE).
3) Polyvinyl Chloride (PVC).
4) Low Density Polyethylene (LDPE).
5) Polypropylene (PP).
6) Polystyrene (PS).

EXPERIMENTAL SETUP

MATERIALS USED

Waste plastic bags were collected from the cloths retail store and are cut into similar shapes and size to have the uniformity during melting of the plastic. The safflower seed husk(SSH) is collected from local oil mill which was disposed as agro waste.

PROPERTIES OF THE MATERIALS USED

1. Low-density polyethylene (LDPE)

Is a thermoplastic made from the monomer ethylene. Its most common use is in plastic bags.

- It is not reactive at room temperatures.
- Quite flexible and tough.
- Weaker intermolecular forces hence lower tensile strength.
- Higher resilience.
- Molecules are less tightly packed and less crystalline due to the side branches, its density is lower (0.910-0.940 g/cm3).

2. SAFFLOWER SEED HUSK (SSH)

- Bulk density (kg/m3) - Range (96-160).
- Length of husk (mm) - 3 – 6.
- Hardness (Mohr's scale) – 5-6.
- Moisture (%) – 8.0-9.0.

METHODOLOGY

Following steps were adopted in the Preparation of sample (SRP).

- The safflower seed husk was brought and ground and sieved to fine powder.
- Husk powder was dried in sunlight for about 24 hour's further the powder was dried in an hot air oven at about 90±5ºC to remove the moisture content completely from the powder.
- Melting of thermoplastic in a graphite crucible by placing in resistance furnace at the range 105 – 115C.
- Thoroughly mixing of ground husk powder with the melted thermoplastic (LDPE).
- Upon mixing the mixture is poured into the moulds directly and rammed immediately with the hand pressure.
- Compression test specimens were prepared according to ASTM D3410.
- Tensile test strips were prepared according to ASTM D638-02a with the suitable mould and ram arrangement.

Figure. 2 . Hot air oven to dry the husk

Figure. 3 . Ungrounded husk

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Figure. 4. Partially grounded husk

Figure. 5. Completely grounded husk powder

Figure. 6. Heating of graphite crucible for melting of plastic.

Figure. 7. Mould for compression testing specimen.

Figure. 8. LHS 70%ldpe 30%huskpowder, RHS 60% ldpe 40% unpowdered husk (precentage by weight)

Figure. 9.View of sample of 60%ldpe 40%SSH (percentage by weight)

Figure 10 View of Sample of 70%ldpe 30% SSH (percentage by weight)

Figure. 11. View of 80%ldpe 20%husk (percentage by weight)

Figure. 12. Mould for tensile test specimen.

Figure. 13. Tensile specimen of 80%ldpe and 20% SSH

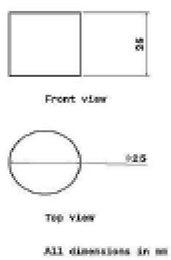

Figure.14 .Specification of SRP specimen for compression test

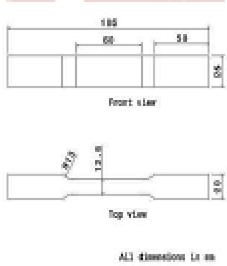

Figure.15. Specification of SRP specimen for tensile test

Figure. 16. Disc made for 70%ldpe and 30% SSH combine SRP

MECHANICAL PROPERTIES OF SRP

1. COMPRESSION TEST

The compression properties composites (SRP) at room temperature were determined for 2 different specimens of a particular composition by following the ASTM standards (ASTM D3410 for compression) and testing in a Universal Testing Machine. The specimen sizes are shown above (Fig14).

2. WATER ABSORPTION TEST

Prior to the testing, the weight of each specimen was measured and conditioned samples of each composite type were soaked in distilled water at room temperature for 24 h. Samples were removed from the water, patted dry and then measured again. The value of the water absorption in percentage was calculated using the following equation:

$WA(t) = (w_{(t)} - w_0) \backslash w_0 \times 100$

Where,

WA (t) - water absorption (%) at time t,

W_o - oven dried weight and W (t) is the weight of specimen at a given immersion time t.

RESULTS

WATER ABSORPTION TEST RESULTS:

Slno	TYPE OF PLASTIC	COMPOSITION LDPE + SSH (% BY WEIGHT)	SPECIMEN DIAMETER (mm)	W(A) t. in % for,24hrs
1.	SRP1	60+40	34	0.032
2.	SRP2	65+35	34	0.021
3.	SRP3	70+30	34	0.044
4.	SRP4	80+20	34	0.026

COMPRESSION TEST RESULTS

COMPOSITE	COMPOSITION LDPE+SSH (% BY WEIGHT)	PEAK LOAD (N)	LOAD (N) STRESS (N/mm2)
SRP1	60+40	8400	9.25
	60+40	12200	13.44

SPR2	65+35	8200	9.03
	65+30	8300	9.14
SRP3	70+30	6400	7.05
	70+30	6600	7.27
SRP4	80+20	6000	6.61
	80+20	5800	6.39

CONCLUSION

The study conducted on the SRP has shown that plastics that are discarded after the use and the agricultural waste safflower seed husk can be successfully utilized to make composite materials having suitable mechanical properties. In the current study, the specimens were prepared without using any binding agent or coupling agent in order to understand the behavior of the composite (SRP) in the absence of agents. It is observed that, more the husk (SSH) Content more will be the strength, but the conclusion is that it is difficult to prepare specimen having more than 40% LDPE due to lack of interfacial bonding and hence it may necessitates the use of binding agents for preparation of different compositions (SRP) of desired proportion. The properties of SSH change with moisture content and those of SRP depends greatly on the manufacturing process.

SCOPE FOR FUTURE WORK

To evaluate mechanical properties with other binders or coupling agents improving the strength. SRP offer a number of advantages, including flexibility of production and the use of recycled material to create a recyclable product. Despite the wide array of possible finished forms, the manufacture of SRP is relatively simple and uniform.

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