Colourful Tiles from Plastic Wastage

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Abstract- ***The present investigation aims at manufacturing floor tiles using waste plastic in different proportions with sand, without use of cement and comparing it with the normal cement tiles. To evaluate different physical and mechanical properties, tests like water absorption test, transverse resistance, resistance to impact and abrasion resistance tests were carried out asper IS specifications on the plastic tile and these test results were compared with the normal cement tiles. These results obtained have shown better results ascompared to the normal cement tiles. As per this study it can be considered to use plastic waste as a binding material instead of cement in the manufacture of floor tiles. Now a days most of the plastic is wasted and thrown in garbage which causes lot of pollution to environment, to reduce this we can reuse plastic waste as colourful floor tiles***

Index Terms- Cement, Sand, Colour Powder

I. INTRODUCTION

Waste is defined as any material that is not useful and does not represent any economic value to its owner. Depending on the physical state of waste, wastes are categorized into solid, liquid and gaseous. Solid Wastesare categorized into municipal wastes, hazardous wastes, medical wastes, and radioactive wastes. Note that, gaseous waste that is held in a closed container falls into the category of solid waste for disposal purposes. However, this study will be focused on biodegradable and photodegradable materials to decompose the waste,along with sufficient moisture and nutrients to sustain microbial action. Thus, the deeper these plastics are buried in the landfill, the less likely they are to decompose. Therefore, it is reasonable to say that that the market for plastic recycling Managing solid waste generally involves planning, financing, construction andoperation of facilities for the collection, transportation, recycling and final disposition of the waste.

Plastic is defined as synthetic or semi-synthetic materials which are polymeric and are composed of large molecules of organic substances known as monomers. The large molecules that are formed during a process known as polymerization are knownas polymers.

A. Objectives

The investigation has been carried out with thefollowing objectives.

1. To design and produce mix proportions for self-compacting concrete (SCC).
2. To obtain and compare the physical and chemical properties of self-compacting concrete.
3. To evaluate the physical properties and chemical properties of turritella and bentonite.

RESEARCH SIGNIFICANCE

In 1998, Althos Poldidor “Method of making composite tiles containing waste plastic”
The present invention concerns a manufacturing processand a related product constituted of a tile in plastic material. The process comprises the following operative stages crushing a thermoplastic material of recovery.

Athanus Konin “Use of plastic wastes bindingmaterial in the manufacture of tiles:
Case of wastes with a basic of Polypropylene” According to konin the plastic waste tiles have lowporosity hence it makes tiles impervious in oppositionto micro-concrete tiles The proportion of 40% ofplastic binder gives best result hence gauging is to beused.

Yong Liu “Mechanical performance of roof tiles made tire powder and waste plastics”
According to the principle that the impact strength is the most important mechanical performance and the modulus of elasticity and elongation at break are the secondly important; a sample that contains equal rubber powder and plastic was taken as best.

II. MATERIALS AND METHODOLOGY

1. Cement:

A binder, known as cement, is used to set, harden, and remain in other materials, binding them together. Cement, sand, and gravel combine to form concrete. OPC 53 grade cement was used throughout the project work.

2. Fine aggregate:
In this study, manufactured sand, which passes through a 4.75 mm sieve, is used as the fine aggregate. The samples are tested according to IS 2386.

3. Coarse aggregate:
The coarse aggregate, which has a maximum size of 12.5 mm and is retained on an IS 4.75 sieve, was chosen based on shape per IS 2386 (Part I) 1963. The aggregate's surface texture properties are classified using 383–1970. The nominal size of 20 mm coarse aggregate is used throughout the project work.

Sand:
Well be graded locally available sand, free from anyorganic impurities, passing through 600 micron IS sieve is used.

Certainly, here are some brief explanations aboutsand.

1. Definition and Composition:
Sand is a granular material primarily composed of finely divided rock and mineral particles. It is a naturally occurring substance found in various formssuch as beaches, deserts, rivers, and seabeds. The composition of sand varies depending on its source but typically includes minerals like quartz, feldspar, mica, and clay minerals.

2. Formation:
Sand is formed through the process of weathering and erosion. Weathering breaks down rocks and minerals into smaller particles over time due to exposure to elements like wind, water, and temperature fluctuations. Erosion then transports these particles, often through rivers or wind, and deposits them in locations where sand accumulates,such as beaches or dunes.

3. Properties:
Grain Size: Sand particles range in size from 0.0625 mm to 2 mm, classified as fine, medium, or coarse depending on their size.

Color: The color of sand can vary widely depending on its mineral composition, ranging from white and beige to pink, black, or green.

Texture: Sand can have various textures, from fine and silky to coarse and gritty, depending on the shape and composition of its particles.

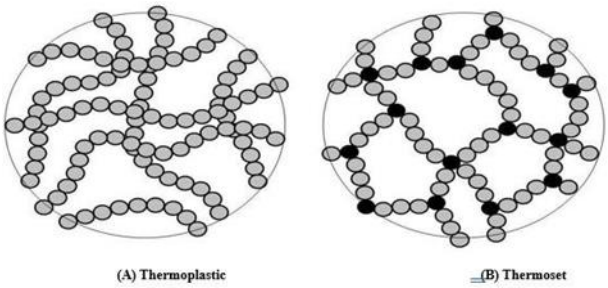
Porosity: Sand is porous, allowing water and airto pass through easily, making it suitable for applications like filtration and drainage.

The selected waste plastic from different elements is weighed, crushed to smaller pieces and then melted in a container at its melting point(150-170 degree celsius). Figure 3 shows the arrangement for melting the waste plastic using furnance and itindicates the waste plastic in its melted form.

Materials made of thermoplastic polymers such as polyethylene (PE), polypropylene (PP), poly(methyl methacrylate) (PMMA), polyacrylonitrile (PAN), polystyrene (PS), polyamide (PA6), polycarbonate (PC), polyvinyl chloride (PVC), polyurethane (PU), *etc.* are widely available on the market, and are increasingly being used in a range of commercial products, from textiles to moulded items. However, these materials are highly flammable and for their safe and wider usage they need to be sufficiently flame retarded, either using appropriate additive(s), or through adequate levels of chemical modification

III. EXPERIMENTAL INVESTIGATION

Many research groups have attempted to quantitatively assess the melt-flow and melt-dripbehaviours of polymeric materials. The vast majority of these studies were based on the UL- 94 experiments. Most of these research groups also suggested methodologies that were based onmeasurements of the mass of drops collected andweighted after the testing of vertically oriented polymer samples. For example, the size and the mass of the drops formed during the UL-94 test were measured in the study carried out on PA-6 systems (BASF, Florham Park, NJ, USA). Otherstudies, performed by different research groups were focused on the evaluation of polymers' melt-flow drip behaviour in fires, whilst those carried out at the University of Bolton, UK, also considered non-flaming operating conditions. The parameters measured and reported in theliterature include: numbers, masses, shapes, sizesof individual drops; real- time mass data and mass loss rate; dripping time and the time at which the first drop appears and falls down; and the viscosity of melts.



Figure(a): Structure of Thermoplastic and

Figure(b): Melted Plastic

Mixing of Materials:

After the waste plastic is melted, the sand is added to it in the same container during beating and the mixture is stirred continuously. The sand shall be added little by little in quantity and stirred well so that a homogeneous mix is obtained. Care shall be taken so that the mixture doesn't catch fire.figure shows the addition of sand to the melted waste plastic.

A. completely prepared mould

Figure(c): Completely prepared tile

IV. RESULTS AND DISCUSSION

COMPRESSION TEST:

Compression test was conducted as per the ASTM D 695-2015 Standard. For this,the standard specimen size is 12.7 x 12.7 x 25.4mm. The specimen is placed between compressive plates parallel to thesurface. The specimen is then compressedat a uniform rate. The maximum load is recorded along with stress-strain data. An extensometer attached to the front of the fixture is used to determine modulus.

Compressive strength and modulus are two useful calculations in this test. They are calculated using the following equations. maximum compressive load Compressive strength = minimum cross-sectional area

Sl. No	Specimen and % of Waste Plastic	Impact Resistance (cm)	Average Impct Resistance (cm)	Normal Cement Tile
1.	Specimen 1 (30%)	27	36.5	30
2.	Specimen 2 (40%)	30		
3.	Specimen 3 (50%)	39		
4.	Specimen 4 (60%)	50		

Equipment used in this test are:

- Instron universal tester
- Extensometer

1.1: Graph for load vs deformation

The compressive strength of concrete is increased by 10% by replacement fine aggregatewith red soil, after which it is reduced.

CONCLUSION

1. With reference to the literature and this study, plastic waste canbe used as a binding agent instead of cement in the manufacture of tiles, inpavement construction etc.
2. The waste plastic with proportions of 10% and 20% by weight of sand were foundation be insufficient to prepare tile.
3. With reference to the results shown I above tables, physical properties like wter absorption, and mechanical properties liketransverse resistance, resistance to impact and abrasion resistanceshowed improved property with increase in percentage of waste plastic from 30% to 60%.
4. Test results for 50% of plastic waste by weight of sand is foundto have transverse resistancenearer to normal cement tile andthe other properties like waterabsorption, resistance to impact and abrasion resistance were on higher side. Hence 50% of wasteplastic content can be consideredas an ideal for preparation of floor tile using waste plastic as binding agent instead of cement.
5. Overall the results obtained for waste plastic.
6. Waste plastic, which is availableeverywhere, may be put to aneffective use in tile.
7. Plastic tiles can helps to reduce the environmental pollution, thereby making the environment clean and healthy.
8. Water absorption of plastic tile iszero percent.
9. With reference to the literature and this study, plastic waste can be used as a bindingagent instead of cement in the manufacture of tiles in the pavement construction etc.

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