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The Possibility of Making a Composite Material from Waste Plastic

Mehdi Seghiri^{1*}, Djamel Boutoutaou¹, Abdelouahed Kriker¹, Mohamed Ibrahim Hachani¹

¹*Université Kasdi Merbah of Ouargla, Laboratory of Exploitation and Valorization of Natural Resources in Arid Areas (E.V.R.N.Z.A.), Ouargla BP 511, 30000 Algeria*

Abstract

The plastic is the most used man-made material in the world through their specific characteristics such as easy manufacturing and shaping, cheaper cost and low density. It is very useful in in different areas such as medicine, architecture, construction and transport. Unfortunately after the use are thrown in nature. Their accumulation poses an environmental problem. Due to the non-biodegradable. The utilization of waste plastic in manufactory of another materiel is a partial solution environmental that will reduce the proportion of waste plastic incineration or landfill.

This work focuses on the Possibility of Making a Composite Material from à sand dune (A natural source abounds) and recycled height density polythene (HDPEr) by mixing the amount. The composite has been designated as roof tile. An experimental test program was conducted on the polymer roof tile containing different percentages (30%, 40%, 50%, 60%, 70% and 80%) of recycled (HDPEr) from the weight of the mixture. Experimental tests were conducted on density, the breaking load by flexural and impermeability test. In this present study, the density of polymer roof tile varies from 1.379 to 1.873 g/ cm³. . The breaking strength by flexural of all polymer roof tile mix were below the resistance of Clay roof tile. A good impermeability gives compared to the control roof tile.

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* Corresponding author. *Tel.;*

E-mail address: seghirimehdi25@gmail.com

1. Introduction:

Although plastic is an essential material in our life. It is used in automotive, electronics, buildings and other industries. This production of this material increased in recent years, which has led to a big environmental problem. The plastic waste is not a biodegradable material. Recycling of plastic waste to produce new materials is one of the solution for getting rid of the mountains of trash. A vast work has been done on the use of various plastic waste as aggregates or fillers or fibres in concrete such as height, polytelene terephthalate (pet) [1-4], polystyrene (PS) [5], expanded polystyrene [6], polyvinylchloride (pvc) [7], low density polythene (LDPE) [8], height density polythene (HDPE) [9], E-plastic waste [10], in mortars (pet) [11-13]. The researchers indicated that the waste plastic could be reused as partial substitutes for sand [14], [2, 7, 14] or coarse aggregate [10].

The research revealed that the incorporation of any types or form or size of plastic waste as aggregates generally decreases the dry density [2, 5, 10, 15].

[15] proposed the use of waste plastic with 10, 15, and 20 % plastic aggregates as replacement of fine aggregates in concrete. The results show that the compressive strength and the flexural strength decrease with increasing the waste plastic ratio. [10] studied the utilization of E-plastic waste as fine and coarse aggregate in concrete with percentage replacement ranging from 0%, 10%, 20 and 30%, the study show also that the mechanical properties of concrete contain the E-plastic waste are lower than the concrete without E-plastic waste.

The use of plastics waste in the concrete give a good advantage to reducing the unit weight of it. But gives lower compressive strength and tensile strength.[1, 2, 7, 11, 12, 16]

A review on the use of the plastic waste in manufacturing of concrete or mortar are available[16] however in this paper based to find a new method to valorized the recycled height density polythene and used a natural source abounds

The recycled height density polythene (HDPEr) melted and mixed with the sand dune (SD) to produce new material used as roof tile. An experimental test program is conducted on composite containing different percentages of HDPEr.

2. Experimental program:

The experimental program is:

- Showed that the composite can be made with different percentage.
- Studied the characteristic of this new material.
- Compared the results obtained with a clay roof tile flat (without plastic) and with the standard.

2.1. Materials:

2.1.1. Sand:

The dune sand used in this work was taken form Ain el Beida of Ouargla (Northern Algerian Sahara) (Fig. 1). The characterization tests were performed at the LTP-South. The results are present in the following table:

Table 1. Properties of Dune sand (SD).

Properties	Dune sand (SD)
Apparent density	1475 kg/m ³
Specific density	2500 kg/ m ³

2.1.2. Plastic waste:

Plastic waste used is High density polyethylene recycled (Fig. 1) derived from crates used for transporting. It is in the form of granulate.

The characteristics were performed in the laboratory of Polymed Company – Sonatrach- Skikda. (Fig. 2).

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