

Biodegradable Additive for the Construction Industry

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Abstract: This paper presents the patent of a new additive for the construction industry, which is obtained from the biomass residues of the wood industry. This additive is biodegradable and has fluidifying, foaming, plasticizing and stabilizing properties. When the additive is mixed with cement binder compositions, cement mortar and concrete, lightweight, flame-retardant cellular materials, thermal and acoustic insulators are obtained.

Keywords: Wood; biomass; waste; additives; construction

1 Introduction

The construction materials industry uses various chemical additives to produce a specific modification of some of the characteristics of concrete, mortar or paste. The action of these additives is, in general, of a physical-chemical nature and therefore they produce alterations of the physical, chemical and mechanical characteristics of the resulting conglomerating compositions.

This patented additive [1] has its application in the production of new materials for construction (light mortars for screeds and flat roofs, lightweight concretes, prefabricated panels, light plates for false ceilings, blocks and bricks for enclosures and interior divisions, with densities that vary between 700-1000 Kg/m³ and with coefficients of thermal conductivity between 0.11-0.34 W/m²K), characteristics that improve the energy efficiency of buildings.

2 Investigation

In this work we present a patent of invention that provides a new additive for the construction and bio-construction industry, it is biodegradable and has fluidifying, foaming, plasticizing and stabilizing properties, as shown in Fig. 1.



Figure 1: New biodegradable additive

The additive is obtained from biomass residues produced by the forest and wood industry. This new additive when mixed with sand, cement and water forms a porous structure inside the building materials during the kneading process, resulting in the acquisition of new light cellular materials, fireproof, thermal and acoustic insulators of varied use in the field of building, see Figs. 2, 3 and 4.



Figure 2: Sample of concrete block



Figure 3: Sample of cement mortar platelets



Figure 4: Sample of prefabricated panel

Below and by way of example shown in Fig. 4 there is a mortar plate produced without using the new additive, its weight is 368.87 g and in Fig. 5 there is a plate of the same size but which has been added the additive that weighs 176,5 g, comparing these platelets that have the same volume we can verify that a difference of weight of 192.37 g is obtained, which reasons why a material of construction produced with this new additive will weigh a 47.84% less.



Figure 5: Sample of cement mortar without additive



Figure 6: Sample of cement mortar with additive

3 Results

The solution provided by this industrial invention patent is based on the fact that it offers the possibility of using biodegradable additives instead of chemical additives and thus obtaining new ecological materials for construction. This new additive does not degrade over time and provides the same benefits as the known air-based chemical additives that are currently on the market. This new additive has a special interest for the construction industry, as it is ecological, biodegradable, sustainable and allows obtaining light, fireproof, thermal and acoustic insulation materials, these characteristics are shown in Tabs. 1, 2 and 3.

Table 1: Density-compressive strength

Density	Resistance to compression	
	Kg/cm ²	MPa
700	58,3	5,8
1000	83,3	8,3

Table 2: Density-thermal and acoustic insulation

Density Kg/m ³	Thermal conductivity W/m ² K	Transmission losses dB
700	0,11	43,7
1000	0,34	46,7

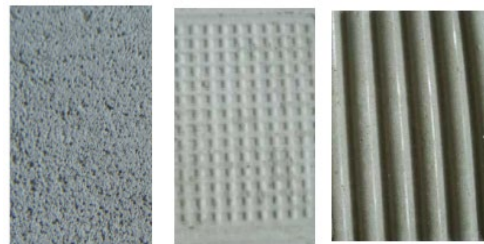
Table 3: Density-fire resistance

Density Kg/m ³	Fire resistance d = 100 mm
700	EI 120 EI 180
1000	EI 120 EI 180

4 Conclusions

The new additive for the construction industry is obtained from waste biomass that has not been treated with chemicals and that are produced by the forest and wood industry. This new additive is a mixture of organic compounds in aqueous phase, and is biodegradable with fluidifying and foaming properties, and is obtained by a technological process developed at pilot plant scale.

When the additive is mixed with cement binder compositions, cement mortar and concrete, lightweight, flame-retardant cellular materials, thermal and acoustic insulators are obtained, as shown in Figs. 7 and 8.

**Figure 7:** Sample of cement mortar**Figure 8:** Sample of cement mortar platelets

These materials have their application in the production of lightweight mortars for screeds and flat roofs, light non-structural concretes, interior partitions, light plates for false ceilings, blocks and bricks for enclosures and light interior divisions, fireproof, thermal and acoustic insulators.

References

1. Torres Lozada, J. C. (2016). Patent of a biodegradable additive for obtaining light cellular materials for the construction industry. *Inventions of the Official Bulletin of Intellectual Property OEPM*, volume II, pp. 19. Madrid, Spain.