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Mechanical characterization of composite materials based on pine needle residues processed by thermocompression

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Abstract

The use of bio-composites based on pine needle and natural resins has industrial interest. In this work have been carried out thermocompression plates, based on pine needles (powder and fiber format) and natural resins (ELO and GREENPOXY). Once characterized mechanically, the optimum combination has been chosen and sandwich panels based on balsa wood and cork have been carried out for subsequent characterization.

The use of GREENPOXY resin and boat wood gives the best results, choosing micronized pine or fiber according to the industrial interest.

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Keywords: composite, pine needle, thermocompression, characterization

1. Introduction

Organic wastes can be a source of waste or can be recycled to originate new materials. Specifically, pine needles from the pines is an organic residue that can be the motivator of fires and its reuse favors the elimination of this material as waste and the generation of new materials [1, 2], which a priori could incorporate appearance and odor to wood.

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Nomenclature

Elo epoxidized linseed oil

Greenpoxi epoxy resin with bio

Some authors have characterized mechanically [3] and thermally [4] the pine needle, while others have developed new materials based on it [5-11]. A complete line of bio-composites based on pine needle has been carried out.

In the first phase of the research line, we have analyzed the influence of pine needle content on the properties of composites with bio-PE.

Once standardized test specimens have been processed for tensile and charpi tests, mechanical and thermal characterization tests have been carried out.

Once the samples with the best performance were selected, a second phase was carried out to optimize the mixtures by adding different maleic acid based compounds. This optimization of the selected blends has resulted in improved compatibility and reduction of hydrophilicity by additives.

After the processing by injection of standardized specimens for tensile and charpi tests, rehearsals of thermal and mechanical characterization have been carried out to analyze possible improvements.

Finally, the development of sandwich panels based on boat wood and cork with pine needles and biodegradable oils and processed by thermoforming has been carried out to select those compounds of major industrial interest in sectors such as construction, both acoustic and thermal, improving the lightness of the current materials used.

2. Experimental procedure

2.1. Laboratory equipment used

The preparation of this composite has been carried out by thermocompression with hot plate press. To make the mixture, the bio-resin and the pineapple particles are poured into a mixing bowl.



(a)



(b)

Fig.1 (a) ROBIMA Press of 10Tn. DUPRA temperature control system, and (b) Planetary mixer, model 5KPMS.

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