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THE INFLUENCE OF CAO ADDITION AND PROCESSING TEMPERATURE ON MECHANICAL PROPERTIES OF RECYCLED RUBBER, PET AND WOOD BASED COMPOSITES

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ABSTRACT

Rubber thermoplastic based composite are a widely used material type due to its good mechanical properties. Considering mechanical properties recycled PET, rubber based composite with optimized obtaining temperature were obtained. Due to its properties rubber act as a matrix and PET as filler. But for enhancing the interfacial adhesion consequently the mechanical properties of the composite a third component was used: high density polyethylene (HDPE). Adding another recycled material wood (sawdust) novel composite with tailored properties can be obtained. The aim of this work is to assess the influence of processing temperature and different percentages of CaO addition on the mechanical properties of the recycled rubber, PET and wood based composites. The composite was obtained via compression molding method. The novel composite was mechanically tested in terms of tensile, compression strength. The surface composites exhibiting the best mechanical properties were investigated by AFM (or SEM) and the optimized compositions were characterized by XRD. Phenomena evaluating which occurs at components interfacial zone was done by contact angle measurement.

Keywords: composite material, recycled, mechanicals properties.

INTRODUCTION

A very important reason for this composite types manufacturing is PET recycling. While rubber waste can be recycle or reused in many ways, for PET recycling there are mainly two routs; the first incineration for energy (partial) recovery, the other rout is environmentally and financially more effective and consists of its full recover, by embedding waste PET in composites.

The main problem in obtaining composites based on recycled PET and rubbers results from their immiscibility, because of their different chemical structures: flexible hydrocarbon - slightly linked chains in rubber; ester chain with side aromatic rings, quite rigid in PET. The reuse of rubber and plastics waste to serve as building materials, as composites, provides a significant market potential for waste recycling.The composite materials based on recycled rubber, PET, wood and CaO as additive was performed using compression molding method. The sample obtained by blending recycled rubber, PET wood and CaO as additive was firstly mechanically tested in order to asses the mechanical properties of the novel composite obtained and surely the others tests was performed. Tensile strength was evaluated with the Z010, Zwick/Roell equipment, at a traction speed of 100 mm/min. The compression resistance was tested on the same mechanical testing equipment, according to SR EN ISO 527-4:2000.

RESULTS AND CONCLUSIONS

The results from the compression tests are summarized in table 1 and Fig. 1.

Table 1 - The Mechanicals properties of the composites with wood and wood+CaO addition

Rubber: PET: HDPE: wood: CaO	**T[^{0}C]**	**t [h]**	**Masa epr g**	**E N/mm^2**	**σ_{tr} N/mm^2**	**F_C N**	**R_c N/mm^2**
80:10:5:5:0	**160**	**1**	**15**	3.27 1.74	1.96 1.69	5934 3834	59.34 38.34
80:10:5:5:0	**190**	**1**	**15**	1.54	1.98	3948.8 3354	39.48 33.54
79.5:10:5:5:0.5	190	1	15	3.93 3.58	2.04 2.02	3585	35.85

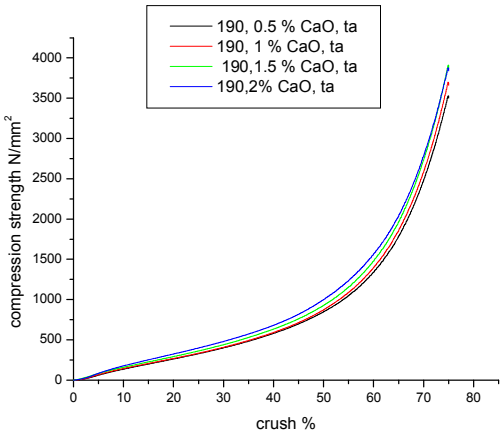

Fig. 1 - Compression test results

After water resistance test it was proved that CaO has a good influence on the mechanical properties and dimensional stability of composites comparing with those without CaO addition.

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