

IMPROVED TIRE ADHESION OF LAMINATES (GTR) BY INCORPORATING RECLAIMED RUBBER (NRR)

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Abstract

This paper seeks to improve the mechanical properties of recycled rubber from waste tires (GTR) through the addition of reclaimed rubber (NRR), with this is to obtain a final material with better mechanical properties and can be used in different applications depending characteristics obtained.

1. INTRODUCTION

The habit of excessive consumption of so-called first world generates lots of waste, a waste of greatest concern for its large size and because it can not easily be recycled is tires, since the mass production of these and the difficulties to manage is one of the most serious environmental problems in recent years throughout the world.

Although it is non-hazardous waste, has features that drive the best way to manage your treatment. Thus, a tire qualities is that it takes more than 100 years to decompose and the other is its high heat capacity, making it difficult for fire fighting, another important feature is its chemical stability (low biodegradability) by which has not been considered as hazardous waste.

Clean way to dispose of unserviceable tires is not easy. One method to eliminate the direct burning waste is causing great environmental and health problems. Also many of these tires stored in dumps, landfills often have large causing great visual impact, in addition to causing stability problems for partial chemical degradation they suffer. Another problem of landfills is that the reefs are accumulations of tires where the proliferation of rodents, insects and other pests is an additional problem.

The objective to be met with this work, is to seek a disposal of these wastes, this will seek to improve their mechanical properties by mixing different types of waste and reduce the problems caused by this.

2. EXPERIMENTAL

2.1. Optimization of the waste tire (GTR).

- Particle size and statistical study material.
- Sintering of the material with hot plates, changing the process variables such as temperature and pressure of compaction.
- Mechanical characterization and optimization of particle size and process conditions.

2.2 Optimization of reclaimed rubber.

- Preparation of the quantities of both materials such as sulphur and accelerator.
- Vulcanization regenerated in hot rollers.
- Sintering of the material in the hot dishes, with variation of temperature and compaction pressure.
- Mechanical characterization and optimization of process variables.

2.3 Addition of elastomeric residue (GTR) Reclaimed rubber (NRR).

- After obtaining the most favourable results as the optimization of processing variables, GTR joins the reclaimed rubber by varying percentages.
- Mix the residue with the composition and the sulphur and accelerator in the hot rollers.
- Hot plates sintering process conditions which are already optimized.
- Mechanical characterization and optimization of the amount of GTR that better results.
- Perform the same process but in this case will be added to the mix adhesive.

3. EQUIPMENT AND MATERIALS

For fabrication and characterization of the material, we have used the following equipment:

- The sintering process is performed by a press Robima SA (Valencia, Spain) with hot Dupre SL (Castalla, Spain).
- Vulcanizing composition was performed using hot rollers Dupre SL (Castalla, Spain) model CM120.
- Traction machine model ELIB Iberstest 50 W (SAE Iberstest, Madrid), with which we have obtained the following parameters: strength and elongation.
- Shore hardness machine, used to determine the resistance of the material to be penetrated by a penetrator type scale Shore A.

For materials used in the preparation of work have been:

- Elastomeric residue from the shredding of used tires called GTR (Ground Tire Rubber) of 250 μm in granulometr a.
- Sheets of reclaimed rubber, which has been added sulphur for vulcanization accelerator.

4. RESULTS AND DISCUSSION

4.1. Mechanical properties of vulcanized rubber composition (NRR).

After analyzing the results of all the plates taken with the material composition, the optimum sintering conditions is achieved with greater resistance are 10000 Kg pressures sintering with a time of 6 minutes and a temperature of 150 ° C. These terms are used throughout the work.

4.2. Effect of the addition of elastomeric residue (GTR) vulcanized rubber composition (NRR).

Obtained more favourable results, according to the optimization of processing variables of reclaimed rubber, will be a new study by the rollers sintering and hot dishes in which to study the effect of the addition of elastomeric residue (GTR) to the rubber composition (NRR).

First mix the reclaimed rubber is vulcanized (NRR) and the residue of tire crushed (GTR) at various proportions (10, 25, 50, 60 and 75%). This percentage corresponds to the amount of waste tire (GTR) for the total mass used for the sintering of the plates. The previous cases these were 150 grams, as is the amount needed to obtain a final plate of about 4 mm thick and be able to make a comparison with results obtained in different plates of prior testing.

After weighing the total amount of both materials, it is then mixed into the hot dishes, which are at a temperature of 90 ° C. This step will add the fixed percentage of sulfur and accelerator for vulcanization of reclaimed rubber. Finally, perform the sintered using the conditions obtained in the previous section, ie a pressure of 10000 kg, a sintering time of 6 minutes and a temperature of 150 ° C that is fixed by curing the rubber composition. The particle size used in the mixture is 250 µm, and that is what is considered optimal in previous studies. Finally, these plates are stamped to obtain the necessary specimens for mechanical testing and the results will indicate what percentage of waste tire which achieve higher mechanical properties of the new material.

With respect to the tensile strength of reclaimed rubber particles mixed with waste tire (GTR), is observed, Figure 1, it increases in the first quantities up to 50% of each of the materials, for then declining sharply, therefore, greater resistance is achieved with the amount of 50% and 50% reclaimed rubber elastomeric waste.

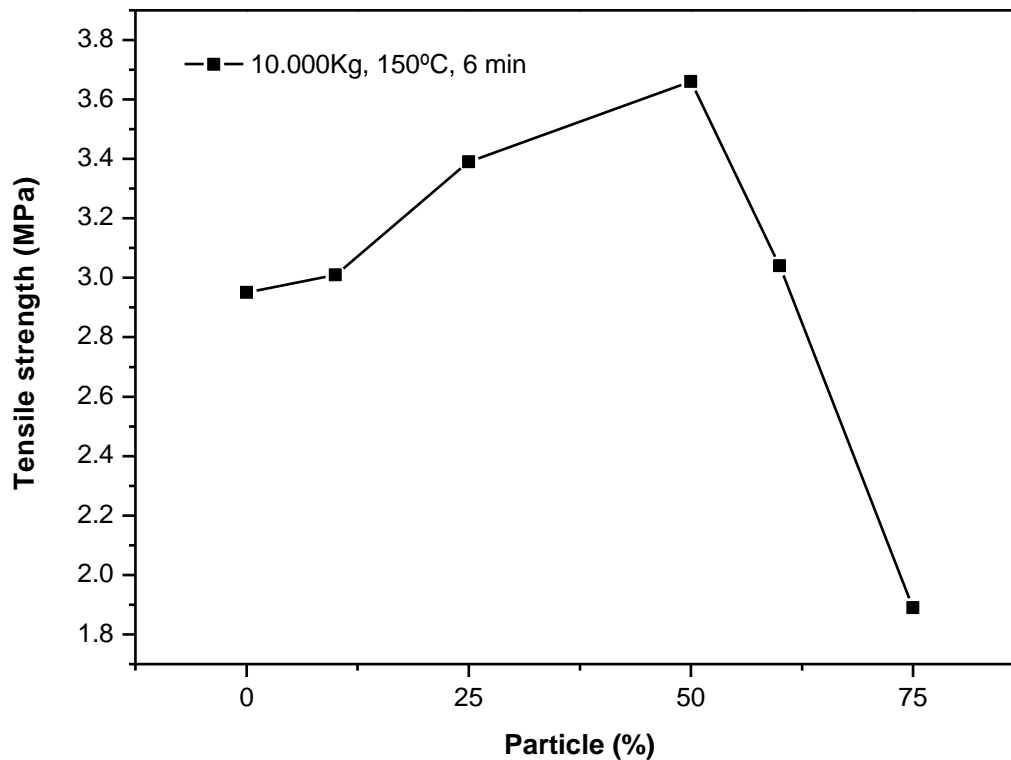


Figure 1. Tensile strength versus percentage of waste tires (GTR).

Regarding the elongation at break is observed, Figure 2, as this greatly increases the quantities of 10 and 25% of number of particles, then continues to grow slightly until the maximum elongation for the number of particles of 50%. From this quantity is the reverse process, which is down very slightly from the number of particles of 50 and 60% and produced a large decrease to the amount of 75% of waste.

Finally, we show the results obtained after conducting the tests of hardness (Shore A) of the different specimens of regenerated rubber particle. As you can see, Figure 3, it increased progressively to reach maximum hardness in the amount of 50% of particle (GTR), and then declined and increased again in the number of particles of 75%.

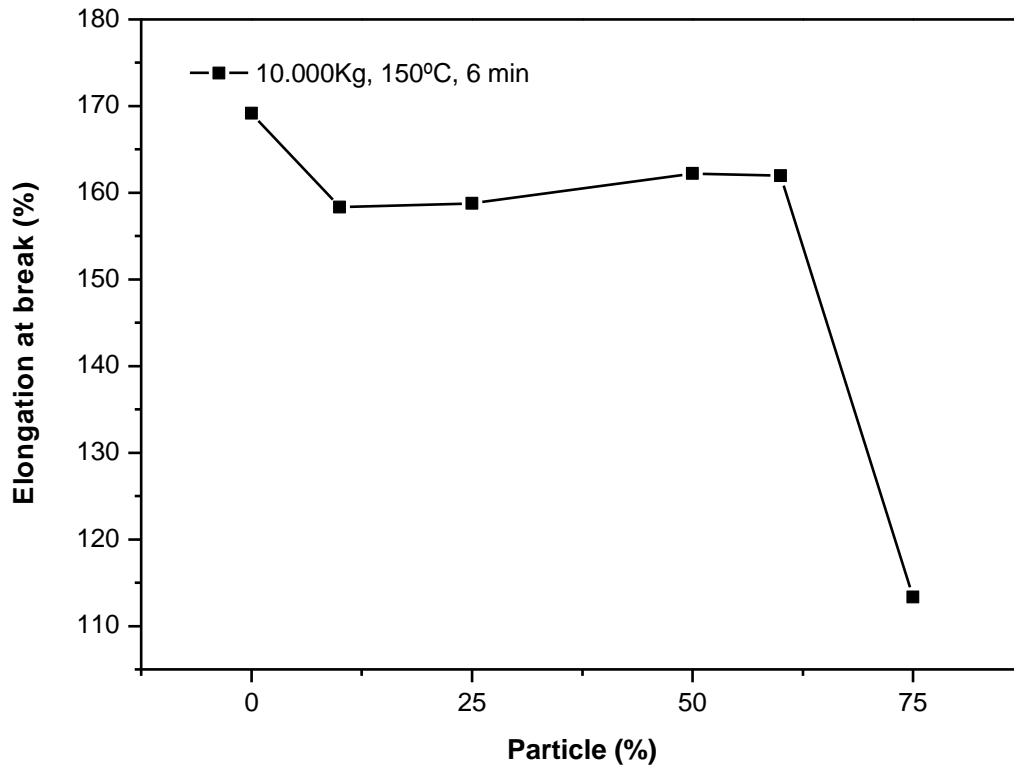


Figure 2. Elongation at break versus percentage of waste tires (GTR).

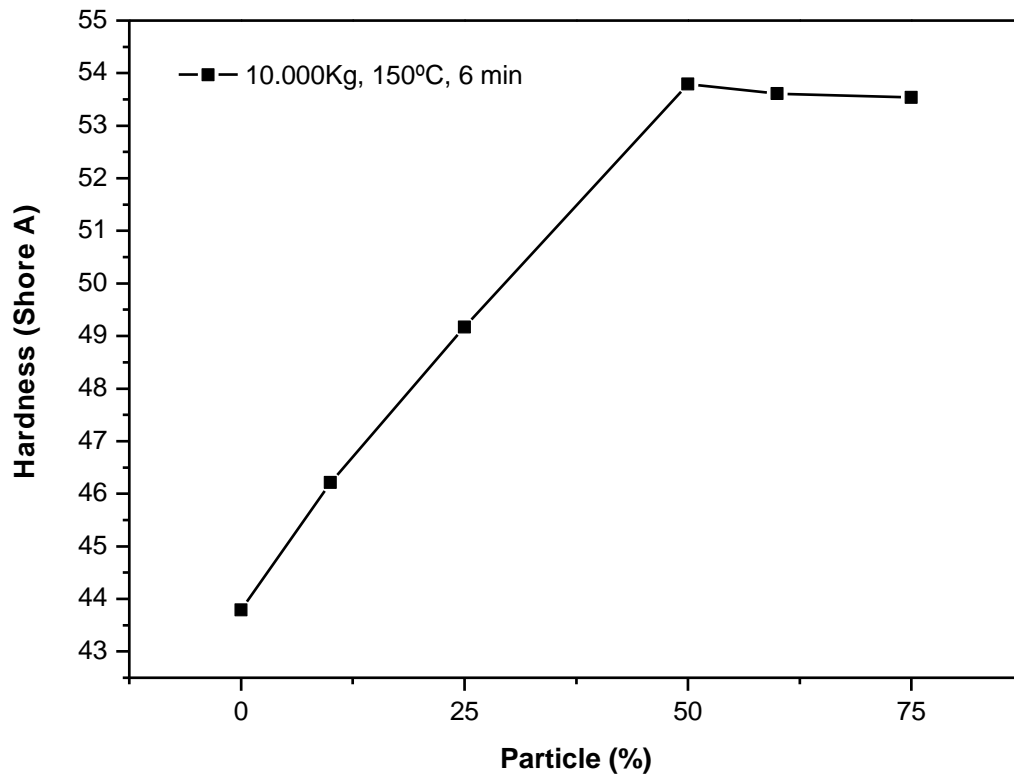


Figure 3. Hardness (Shore A) versus percentage of waste tires (GTR).

5. CONCLUSION

After analyzing the results of mixing the reclaimed rubber tire waste ground (GTR) yields the conclusion that the proportion of optimal particle addition, which is achieved with higher mechanical strength, in this case coincides with the highest elongation and toughness is greater than 50%.

Therefore, the addition of particles of waste tire rubber composition gives rise to a new material with greater resistance than rubber base composition, although the elongation is slightly lower, also achieving a higher hardness.

6. ACKNOWLEDGEMENTS

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