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STEM21

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Recycling TPO Based Automotive Parts into Roof Shingles

Kasey Harrell, 8th Grade
Unique Peterson, 10th Grade
Ecotek Lab

THE PROBLEM

The problem we are facing is that we have too much waste from car parts that are being placed in landfills. This causing a lot of pollution and degradation of the Earth



THE SOLUTION

A solution would be to recycle car parts from TPO to make roof shingles. This will increase the recyclability of cars and increase the sustainability of materials across different industries.



RESEARCH PLAN

- Understand what TPO is and how its used to make cars.
- Understand the melting point of TPO and how it bonds with other materials
- Understand what roofing shingles are used for and their physical and chemical properties.
- How to properly recycle TPO into roof shingles



Millions of cars are discarded to the landfill. According to research from Automotive Recycling, only a small percentage of plastic is recycled. Better recycling and reuse of plastic parts from vehicles is greatly needed. So how can reclaimed automotive TPO be used in other industries? Today, tires are recycled to create roads and basketball courts. What if, we are able to take reclaimed automotive TPO and convert it to roof shingles? This would help the automotive industry and the construction industry. In this research project we are examining the physical properties- melting point-of TPO and shingles to see how easily this transition could happen and what factors need to be considered to build a seamless recycling system.

EXPERIMENTAL SECTION

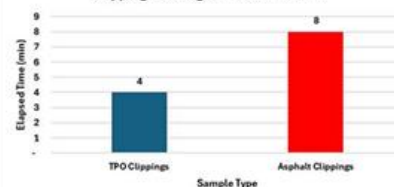
In our experiment we took some shredded TPO from a bumper, melted it down and combined it with asphalt components. We then tried to melt a roof shingle to see if it had the ability to be turned into a liquid. We compared both materials to see what is the best process to pursue when recycling. Should it be shingle to car part or reclaimed car part to roofing shingle. We did our experiments in a chemical fume hood.



RESULTS

The results of our lab experiment was different than what we had assumed. One of the key processes is to be able to melt the materials to allow it to be reused or reshaped. We found that the TPO clippings melted more evenly and faster than the asphalt shingle clippings. This gives us the idea that shingle clippings are made up of more than just TPO. They have other components that can affect the melting point, such as binders, thus affecting the ability for it to be combined with reclaimed TPO clippings.

TPO Clipping Melting Time vs Asphalt Shingle Clipping Melting Time Test Results



FUTURE WORK

Our future work is to examine how TPO absorbs water in comparison to roofing shingles. The goal is to better understand what factors need to be normalized in order to make the recycling process of reclaimed automotive TPO to roofing shingles easier.

Conclusion: We have learned a lot from this experiment. We thought that the recycling process would be easy, but it is not. We have found that it may be better to use reclaimed automotive TPO for roof linings rather than shingles. The linings are smoother and require less adjustments and changes in the structure of the final product.

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