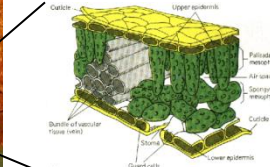
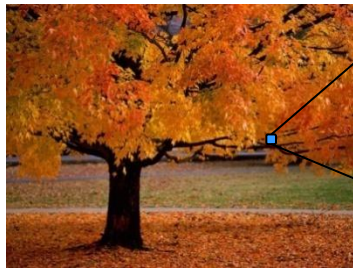


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OBJECTIVE AND BACKGROUND

- The objective of this research was to find a way to decrease the cost of composites that are made out of modified vegetable oil resins.
- Leaves are being investigated in this work as potential fillers due to their abundance and low (non-existent) cost, with the objective of producing composites with acceptable mechanical properties and higher percentage of renewable resource.
- The US alone collects 30 million tons of leaves every year as waste.
- Leaves have a waxy layer which naturally helps in the intake and outtake of water of the plant. This presents a problem because this waxy layer gives the leaves poor compatibility with the resin, resulting in composites with poor mechanical properties. So this work, also, presents the challenge of trying to find greener routes for dewaxing the leaves.



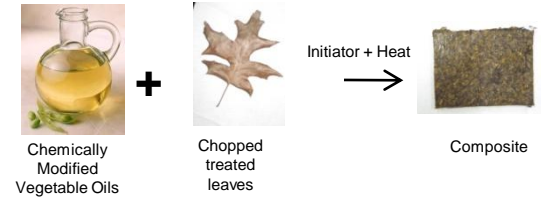
METHODS

◆ Dewaxing

- Dewaxing the leaves
 - Benzene-Ethanol (B-E)
 - Boiling water
 - Acetone-Toluene (A-T)
 - Strong Detergent, bleach
- Dewaxing the leaves and γ -MPS treatment
 - Boiling water and γ -MPS
 - Benzene-Ethanol and γ -MPS
- Carbonized leaves
 - 215 °C (25°C for 3 hrs - 215°C for 12 hrs)
 - 450 °C (25°C for 3 hrs - 215°C for 12 hrs - 450°C for 1 hr)

METHODS

◆ Composite



- Two types of resin were used CB 4 and CB5; where CB4 contains 70% of maleinized acrylated epoxied soybean oil (MAESO) and 30% of styrene, and CB5 has 55% of MAESO, 15% of maleinized acrylated epoxied linseed oil (MAELO) and 30% of styrene.
- CB4 was mixed with leaves that were treated with Boiling water, Boiling and γ -MPS, Benzene-Ethanol and γ -MPS, and carbonized leaves to 215°C and 450°C
- CB5 was mixed with leaves that were treated with Boiling water, Boiling and γ -MPS, Benzene-Ethanol and γ -MP

RESULTS

Resin	Treatment methods	E' a (MPa)	Tg (°C)
CB4	-	1184	82
	Boiling water	1210	85.9
	Boiling water – γ -MPS	1287	93
	Benzene –ethanol - γ -MPS	1229	91.25
	Carbonized_215	1184	83.5
	Carbonized_400	1221	90.8

RESULTS

Resin	Treatment methods	E' a (MPa)	Tg (°C)
CB5	-	1210	88.0
	Boiling water	1215	92.8
	Boiling water – γ -MPS	1289	95.9
	Benzene –ethanol - γ -MPS	1227	94.4

CONCLUSION

◆ Dewaxing

- Boiling water with γ -MPS, and 10% of Strong detergent are the best treatments so far for removing the wax
- Nonetheless other methods of removing the wax are being explored, 5% and 2% of strong detergent at 80°C

◆ Composite

- We were able to obtain composites that had good properties employing bio-based resins and treated leaves
- The composites prepared with natural resins and treated leaves with boiling water and γ -MPS gave the best mechanical properties.

ACKNOWLEDGEMENTS

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