SUSTAINABLE BIOECONOMY
FOR ARID REGIONS

GUAYULE RESIN FOR ADHESIVES

RESIN ADHESIVE POTENTIAL

- Guayule resin blended with either plant-based adhesives or urea-formaldehyde adhesives increases wet adhesion strength
- Guayule resin is a source of sustainable bio-based adhesives

EXECUTIVE SUMMARY

Guayule (*Parthenium argentatum*) is a desert-adapted shrub that produces natural rubber in its stems. To establish a new industry for natural rubber production in Southwestern US, all components of the guayule plant must be valorized. Between 5 – 10% of the plant is resin, which is a complex mixture of guayulins, terpenes, terpenoids, fatty acids, and argentatins.

Guayule resin without any modification is not a suitable adhesive. However, when the guayule resin is modified and blended with bio-based or petroleum-based resins, the wet and dry tensile strengths of the blended adhesives are better than the pure bio-based or petroleum adhesives. Potential applications include foundry sand adhesives, children's glue, packaging, and wood adhesives.

SBAR ACCOMPLISHMENTS

Chemically modified guayule resin has been tested as a wood adhesive using ASTM standard methods. Initially it was blended with soy protein adhesives and shown to increase the water resistance of the plant adhesive by 60 to 70%, while no negative effects on dry adhesive strength were observed. The blended adhesives have been characterized using chemical, mechanical, and spectrometric techniques. The guayule resin/soy protein blends have been used as a binder for particle board.

Guayule resin has been blended with commercially available formaldehyde-based adhesives and shown to increase both the wet and dry adhesion strengths. These blended adhesives can reduce our use of formaldehyde, which is an irritant.

PATENTS SUBMITTED

- Modified guayule resin/ soy protein blends for bio-based adhesives
- Particle boards including guayule resin/soy protein blends

POINT OF CONTACTS

- **Sarocha "Mimi" Pradyawong**. UArizona. Tucson, AZ. mimi@arizona.edu
- **Kim Ogden**. UArizona. Tucson, AZ. ogden@arizona.edu

FUTURE WORK AND POSSIBILITIES

> Future work will focus on further characterization of the guayule resin blends to understand the chemical and mechanical properties, as well as use of the blends in particle board formulations.

> Guayule resin fractions will also be tested to evaluate the potential of generating multiple products from the resin.

WHAT IS STILL NEEDED

> Partnerships with chemical and bio-based product companies.

> Detailed adhesive market analysis.

> Scale-up of guayule resin fractionation and separation.

> Testing of guayule resin/soy protein particle boards for strength and water resistance.

> Partnerships with particle board companies and other industries.

For more information: https://sbar.arizona.edu

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