

Development of Palm Oil-based Resins for Natural Fiber Composites

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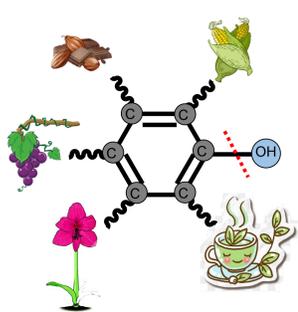
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1. Introduction



Palm oil (PO): triglycerides, i.e., glycerol esters with fatty acids; abundance, renewability and low-costs.



Natural phenols

Advantages:

- Renewable resources such as tea leaf and cocoa beans
- Biodegradability and recyclability
- High rigidity from benzene ring

The **main objective** of this work is to present a strategy to utilize PO in developing biobased and recyclable thermosets with superior thermal and mechanical performance for biocomposites.

2. Reaction mechanism

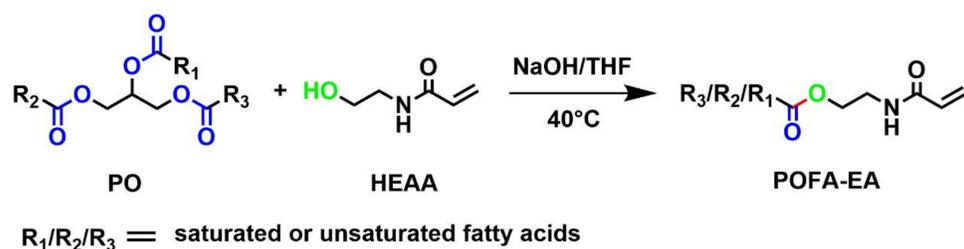


Fig. 1. Synthesis of POFA-EA via transesterification of PO with HEAA.

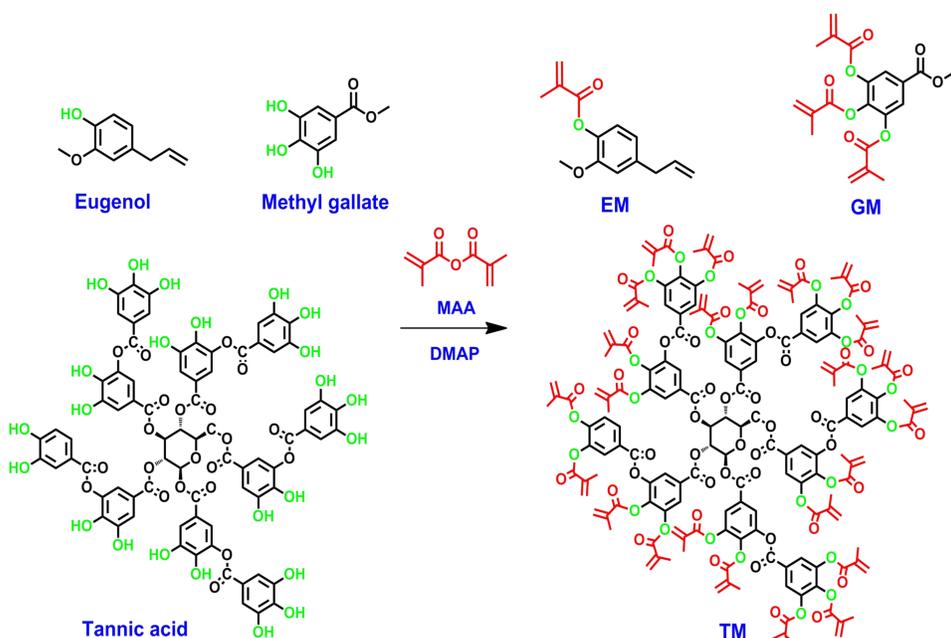


Fig. 2. Synthesis of EM, GM and TM via esterification with MAA.

3. Results and Discussion

Structure of POFA-EA and NP cross-linkers

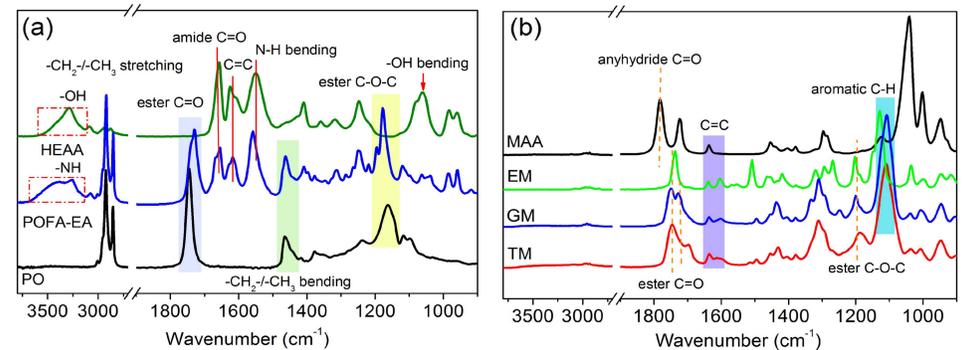


Fig. 3. (a) FTIR spectra of PO, HEAA and the synthesized POFA-EA; (b) FTIR spectra of MAA and the synthesized EM, GM and TM.

Viscosity of POFA-EA and DSC of resins

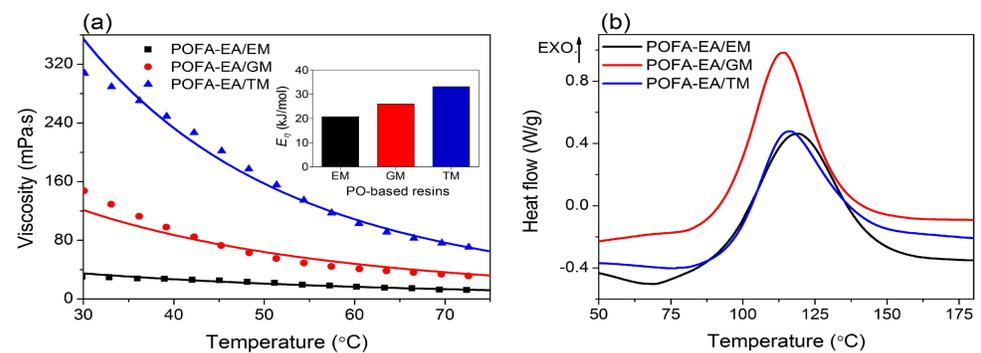


Fig. 4. (a) Viscosities of PO-based resins versus temperature; (b) DSC curves of PO-based resins at a heating rate of 10°C/min.

Mechanical properties

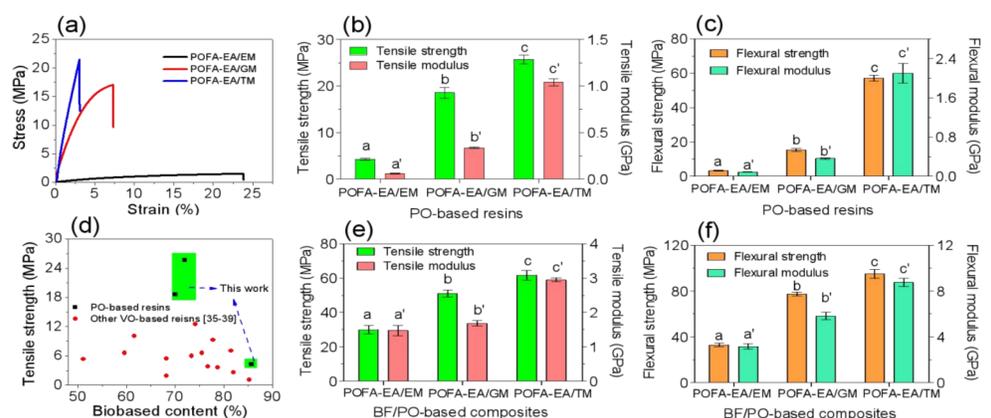


Fig. 5. (a) Tensile stress-strain curves of resins; (b) Tensile properties and (c) flexural properties of resins; (d) Comparison of tensile properties with other VOs-based resins; (e) Tensile properties and (f) flexural properties of composites.

4. Conclusion

- A novel and biobased vinyl monomer was synthesized via a simple and efficient one-step method from PO.
- Novel application of natural phenolic was applied in biobased cross-linkers for PO-based thermoset from.
- The biocomposites have satisfactory mechanical properties and T_g and are anticipated to be fully degradable.