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Cationic/Waxy Starch Blends for Bio-Based Pressure-Sensitive Adhesives

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Motivation

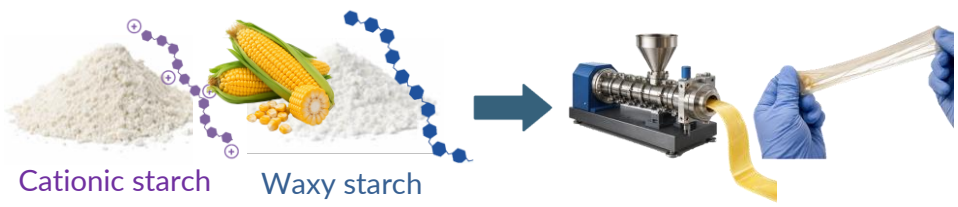
PSA (Pressure-Sensitive Adhesive) is an instant light pressure-activated adhesive, but conventional PSAs rely on fossil-derived polymers and volatile organic compounds, causing environmental and health concerns [1-3].



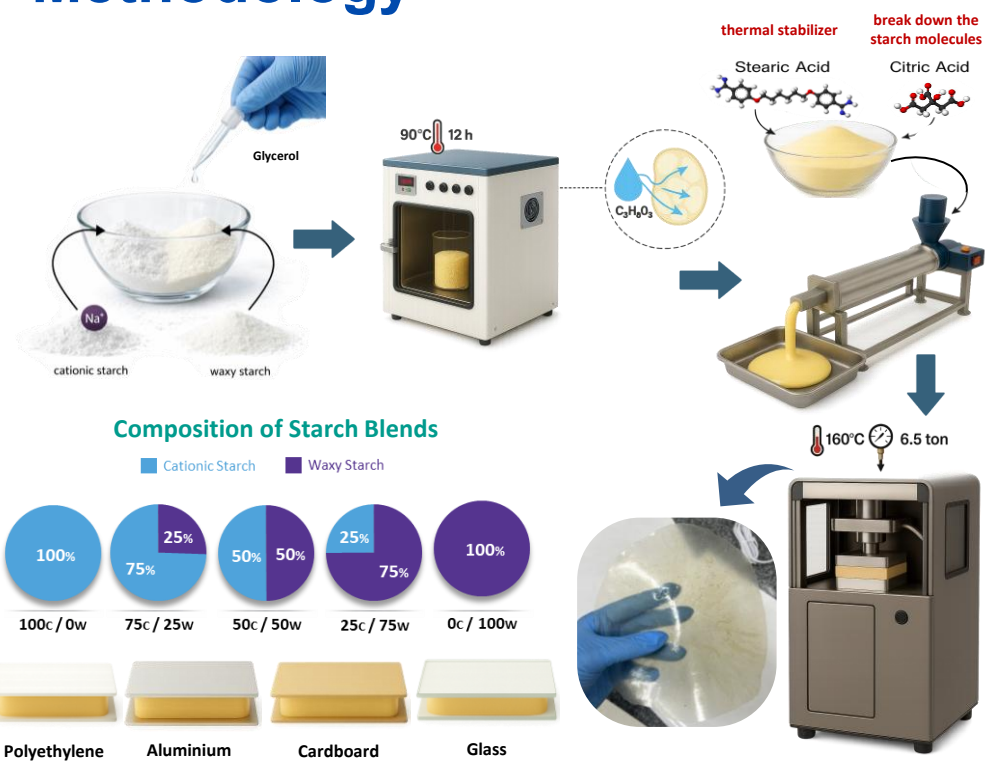
We need sustainable alternatives!

Objetives

Develop and evaluate bio-based PSAs from cationic and waxy starch blend thermoplasticized using extruder for scalable production.

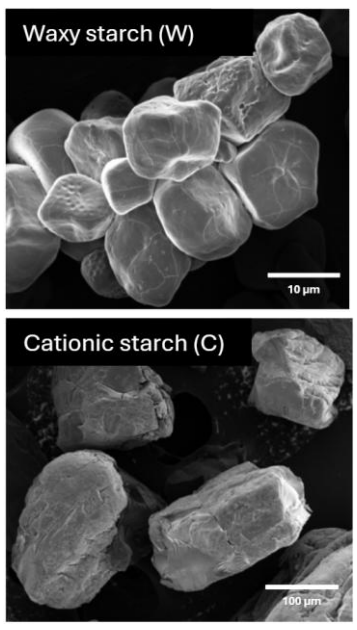


Methodology

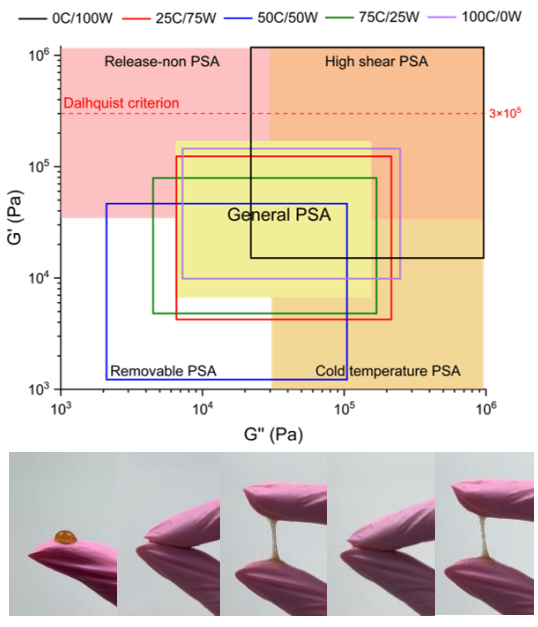


Results and Discussion

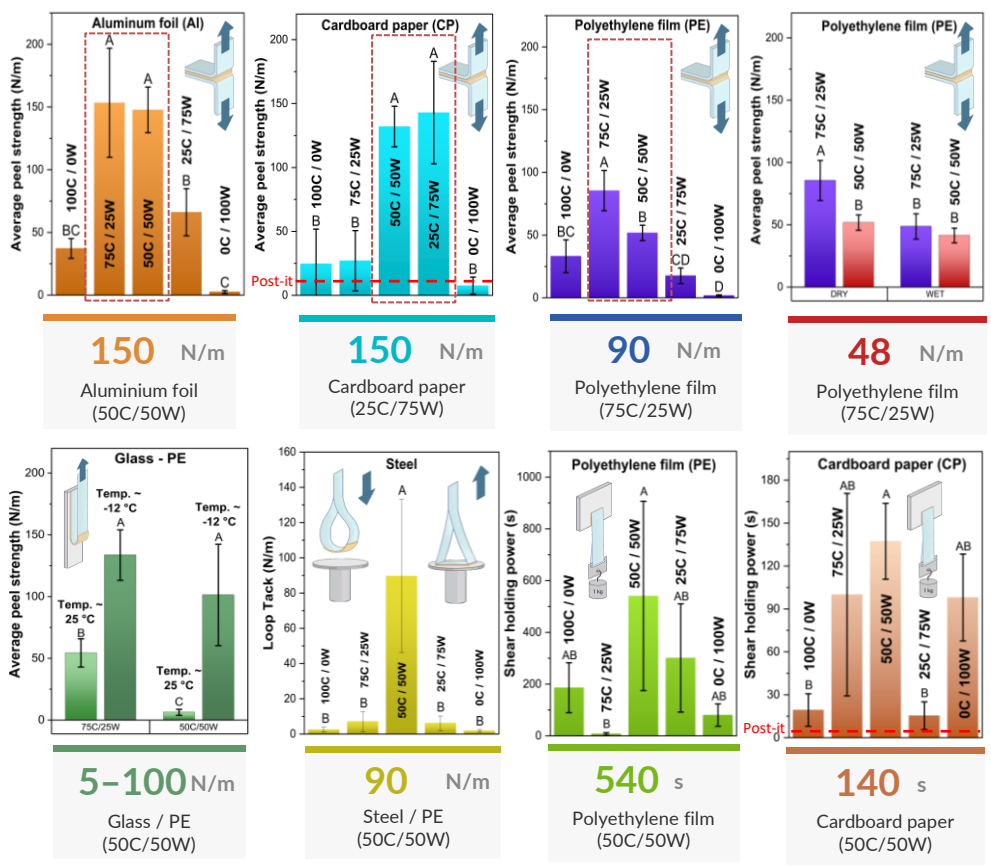
MORPHOLOGY



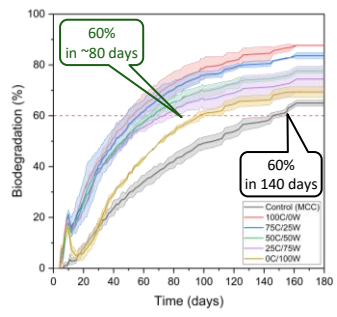
VISCOELASTIC PROPERTIES



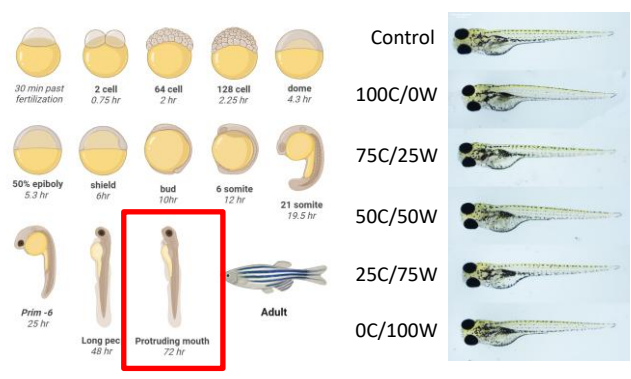
ADHESION PERFORMANCE (PEEL STRENGTH)

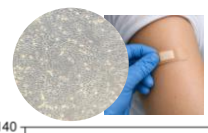


BIODEGRADATION

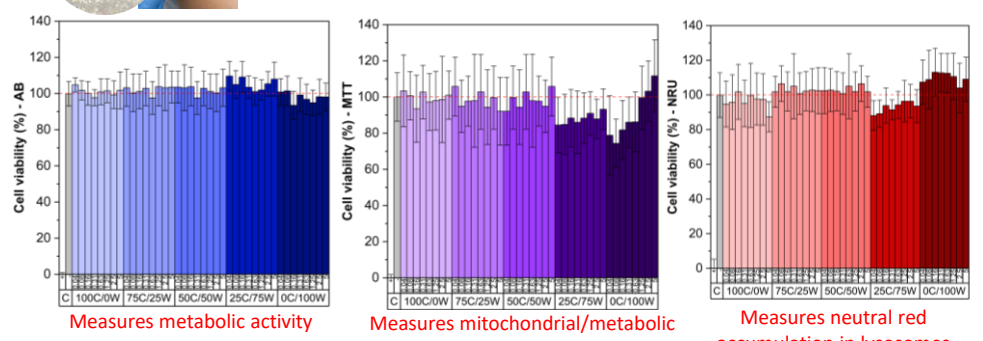


FISH EMBRYOS TOXICITY





CYTOCOMPATIBILITY ASSAYS



Measures metabolic activity

Measures mitochondrial/metabolic activity

Measures neutral red accumulation in lysosomes

Conclusions

The optimal cationic/waxy starch formulation 50C/50W delivered high adhesive performance and was successfully processed at industrial scale, demonstrating its potential as a biodegradable, VOC-free alternative to conventional PSAs.

References and Acknowlegdments

[1] PRADEEP, S. V.; KANDASUBRAMANIAN, B.; SIDHARTH, S. A review on recent trends in bio-based pressure sensitive adhesives. The Journal of Adhesion, v. 99, n. 14, p. 2145–2166, 2023. [2] VENDAMME, R.; SCHÜWER, N.; EEVERS, W. Recent synthetic approaches and emerging bio-inspired strategies for the development of sustainable pressure-sensitive adhesives derived from renewable building blocks. Journal of Applied Polymer Science, v. 131, n. 17, 2014. [3] LIU, L.; YE, X. P.; BOZELL, J. J. A comparative review of petroleum-based and bio-based acrolein production. ChemSusChem, v. 5, n. 7, p. 1162–1180, 2012.

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