

Valorization of Potato Peel Waste for Biodegradable Food Packaging Materials Using Deep Eutectic Solvents

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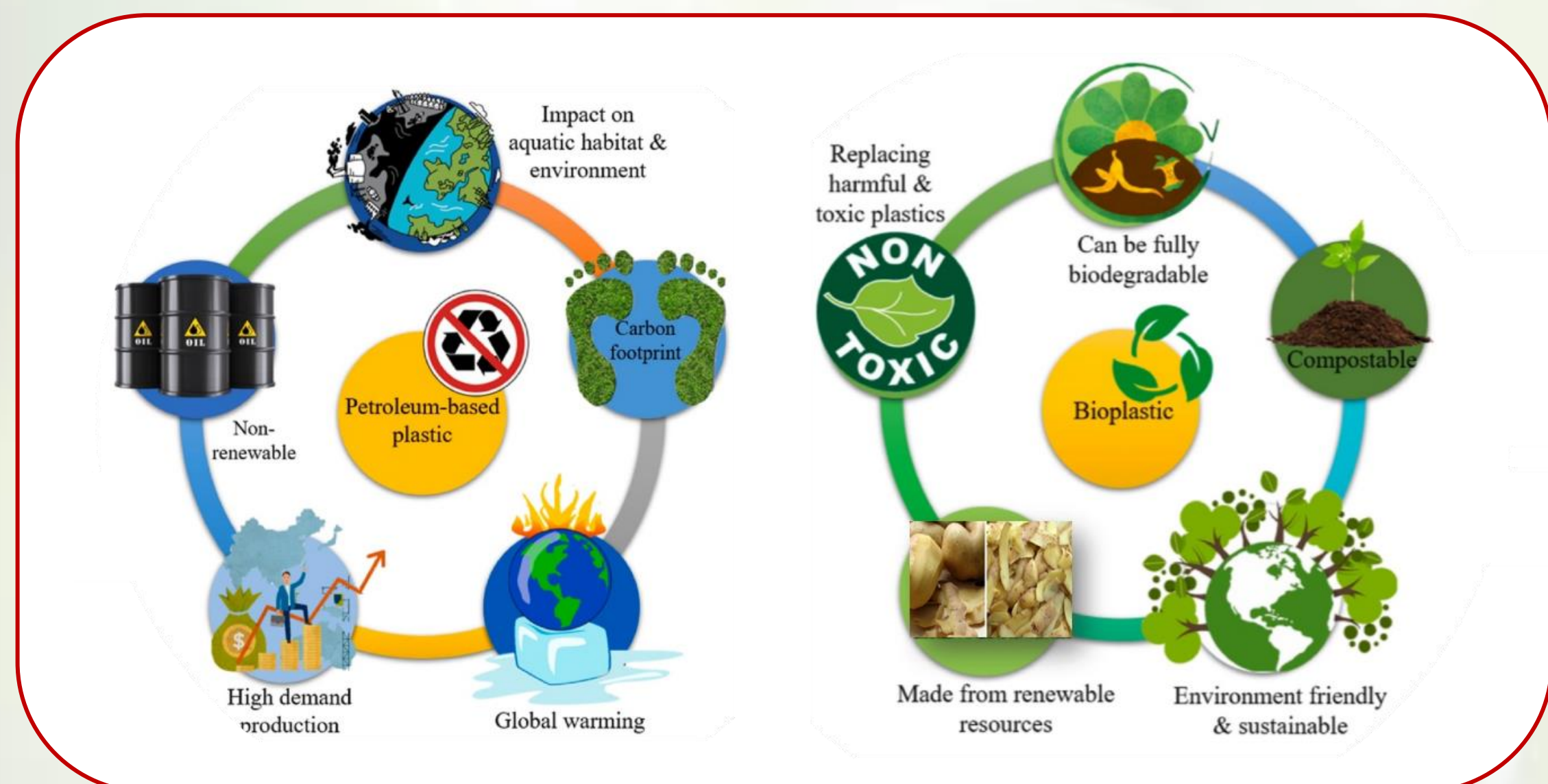
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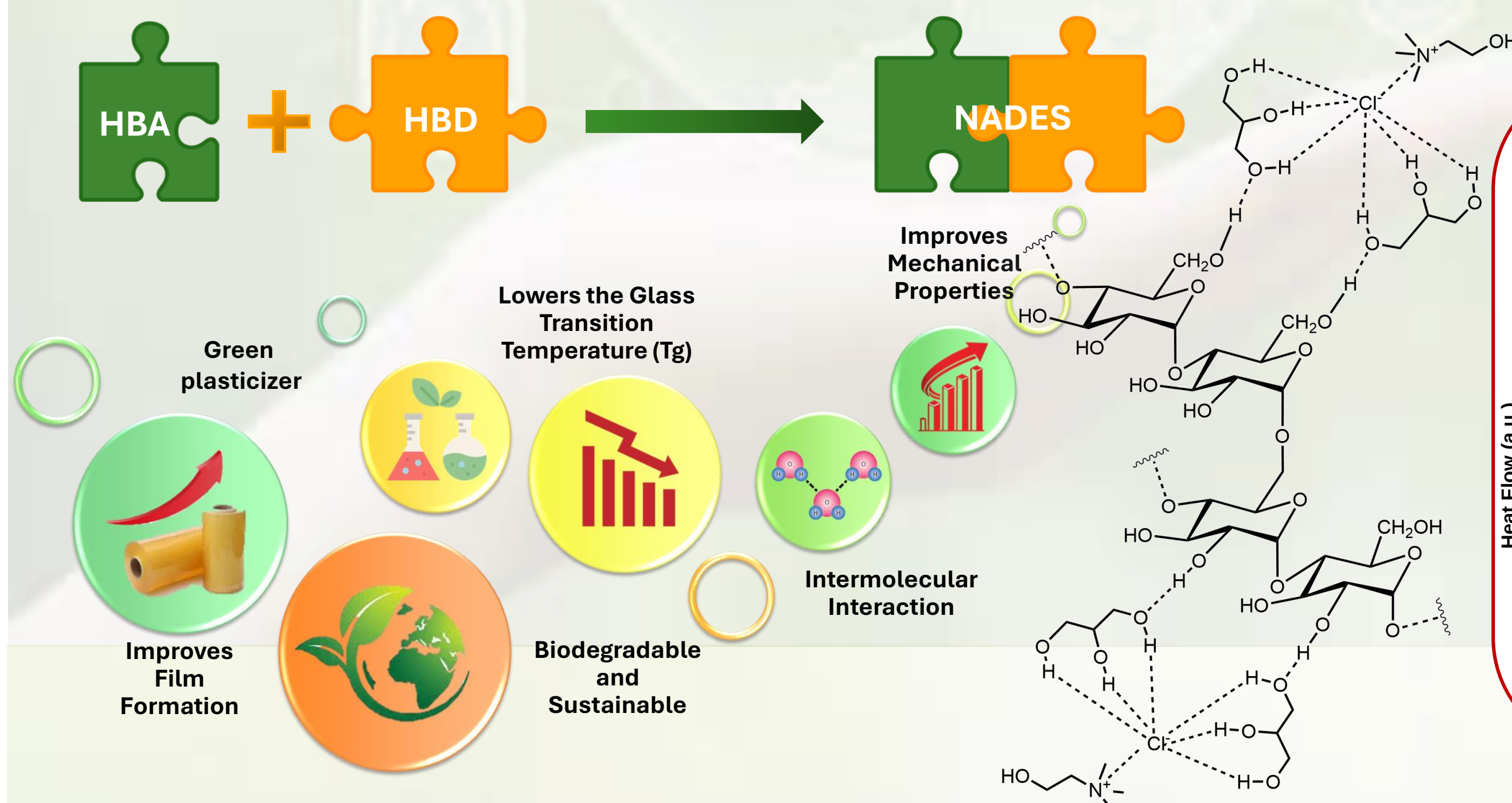


1. INTRODUCTION

The extensive reliance on non-biodegradable, petroleum-derived polymers in packaging has led to serious environmental concerns, emphasizing the need for sustainable, circular economy-based alternatives.¹ Potato peel (PoP), an abundant agro-industrial byproduct rich in starch, offers a valuable feedstock for the development of biodegradable materials.² Natural Deep eutectic solvents (NADES), have emerged as effective green plasticizers for polysaccharides. They are defined as eutectic mixtures of a hydrogen bond donor and a hydrogen bond acceptor.



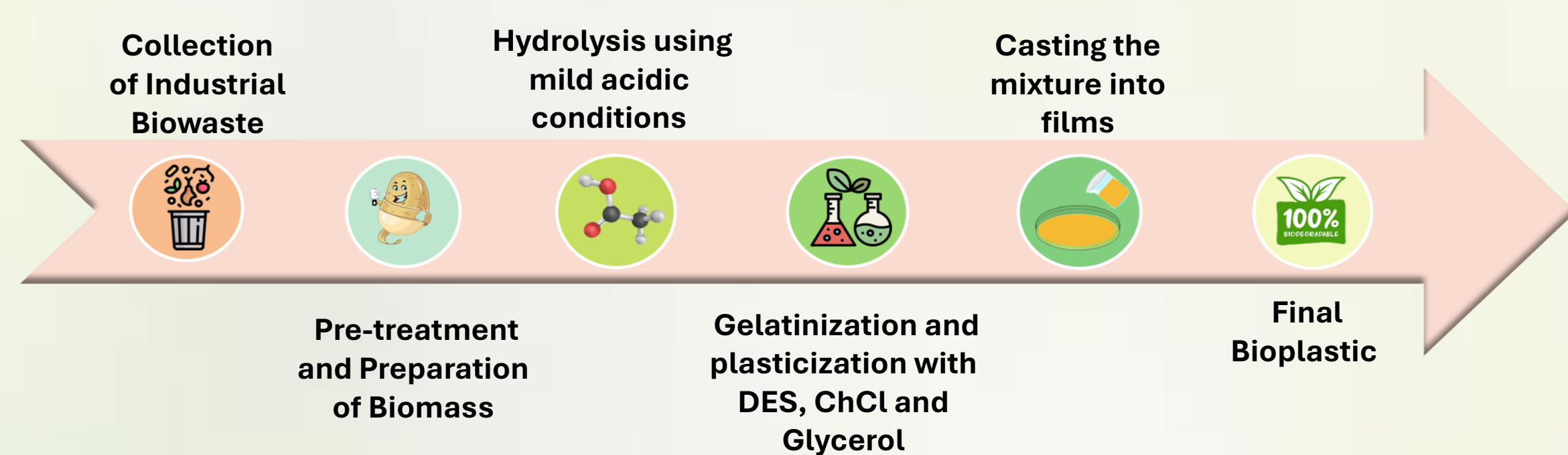
• ROLE OF NADES •



2. OBJECTIVE

The primary objective of this study is to evaluate the plasticizing effect of a specific NADES, composed of choline chloride and glycerol (ChCl: Gly, 1:2), on both isolated potato starch (PS) and hydrolyzed potato peel biomass (PoP). The performance of this NADES will be compared with its individual components, choline chloride and glycerol, used separately as plasticizers at a 20 wt. %.

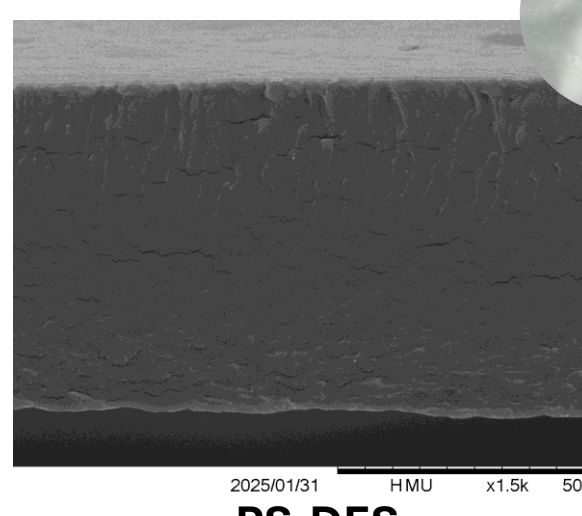
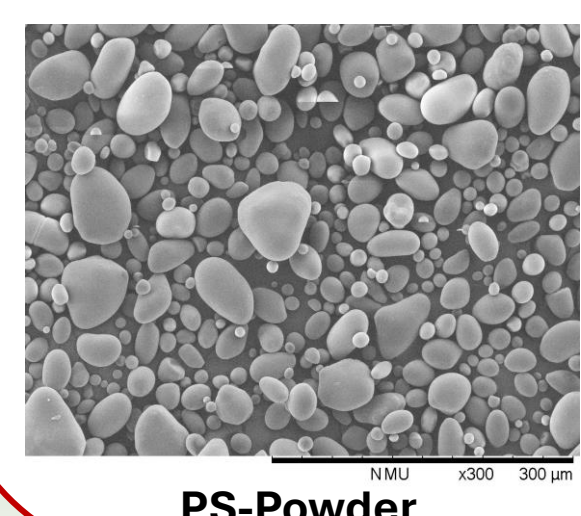
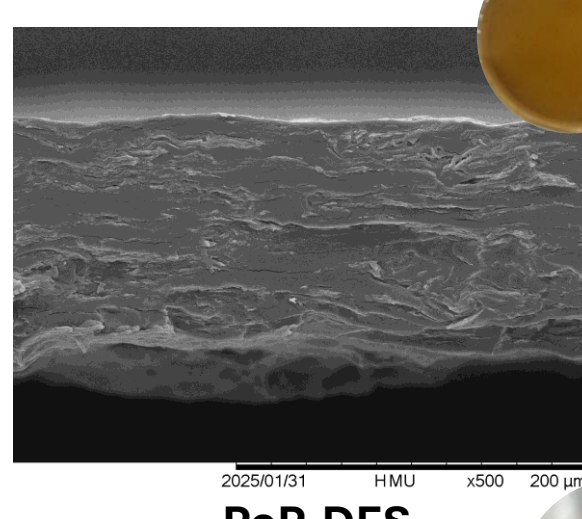
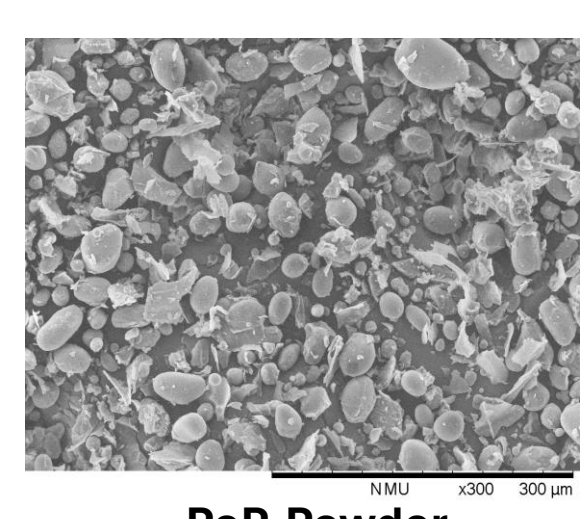
3. EXPERIMENTAL METHOD



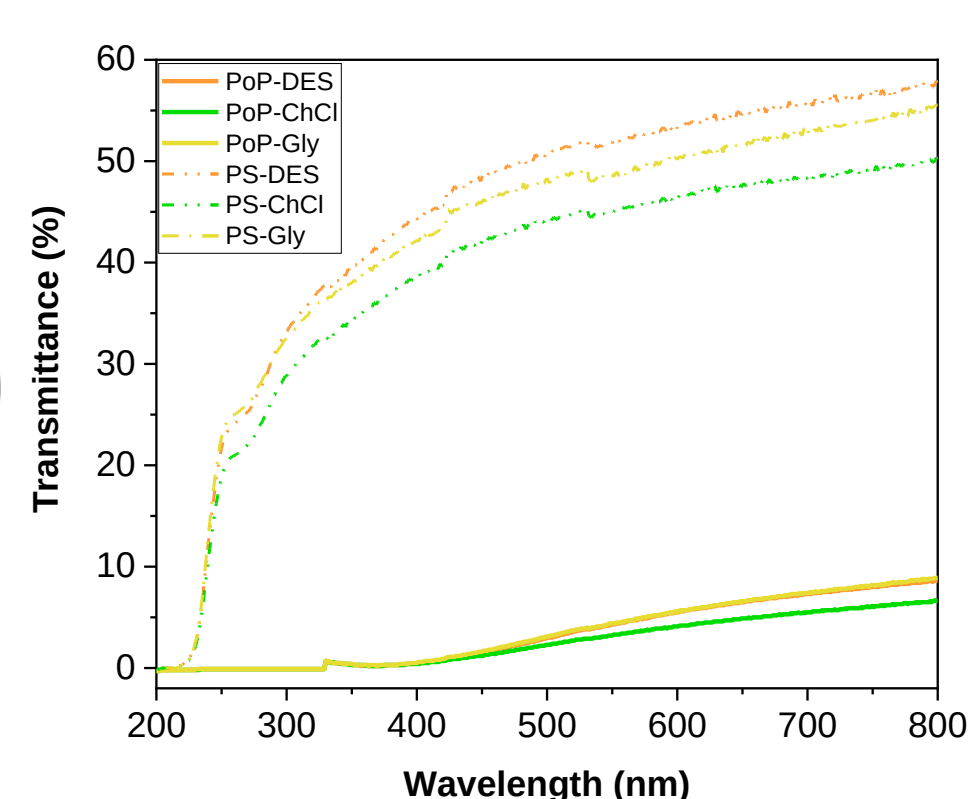
4. RESULTS

4.1 Morphology of Bioplastics

SEM Images

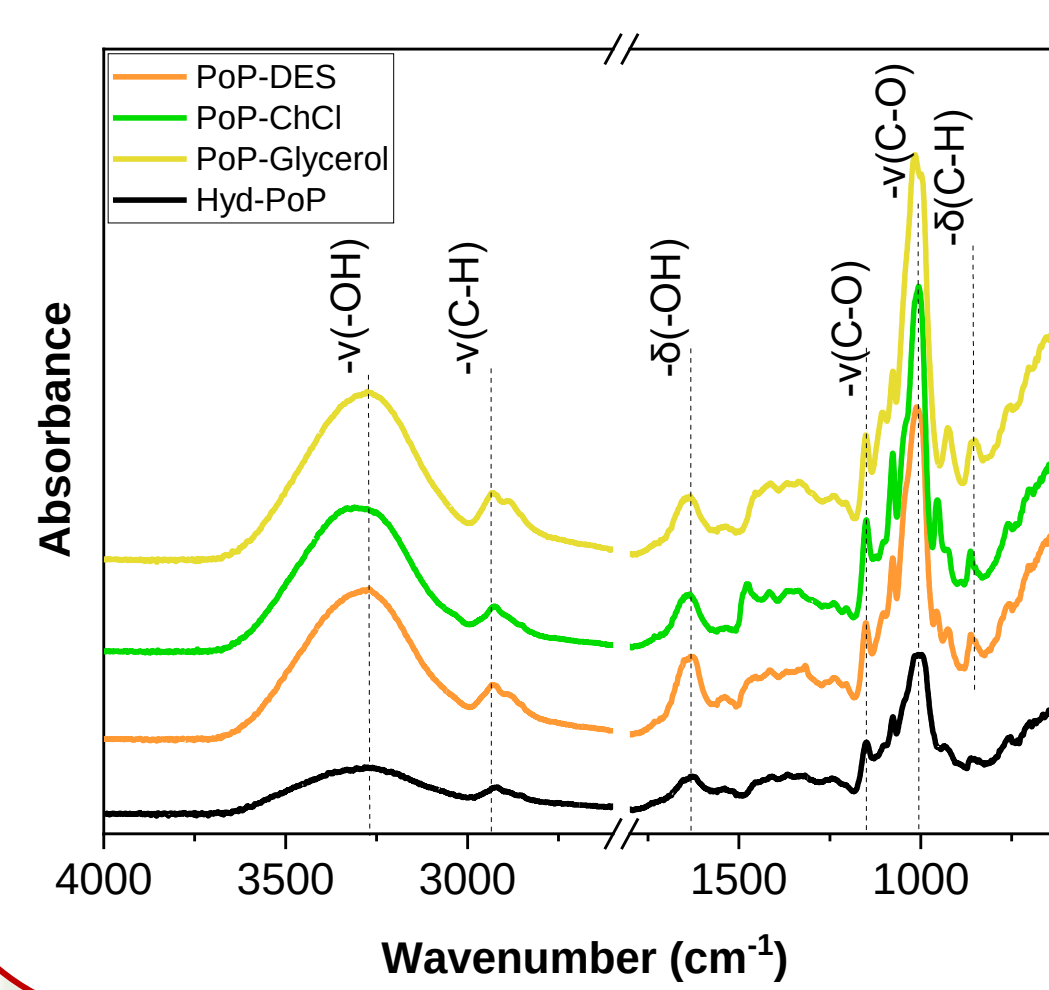


UV-Vis Spectra

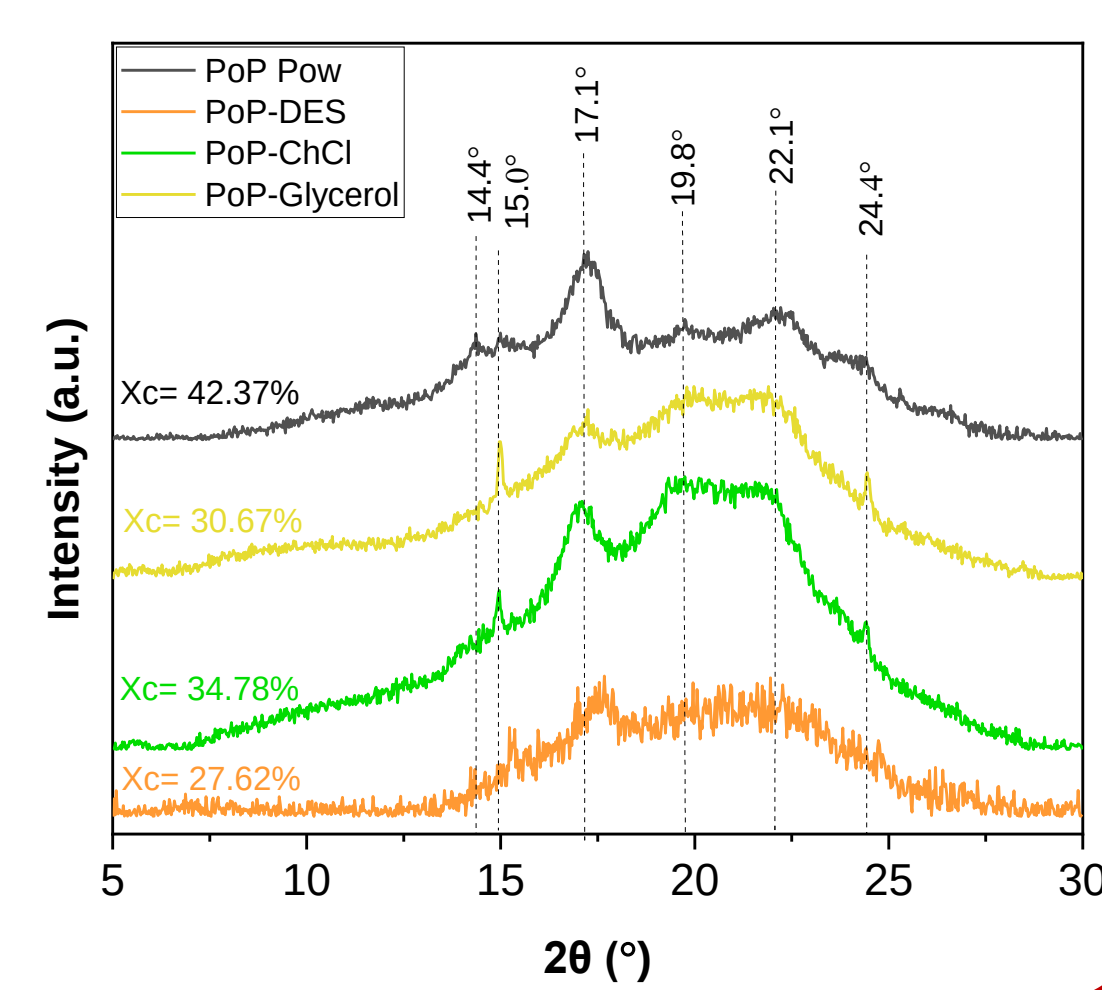


4.2 Physicochemical characterisation

FTIR Spectra

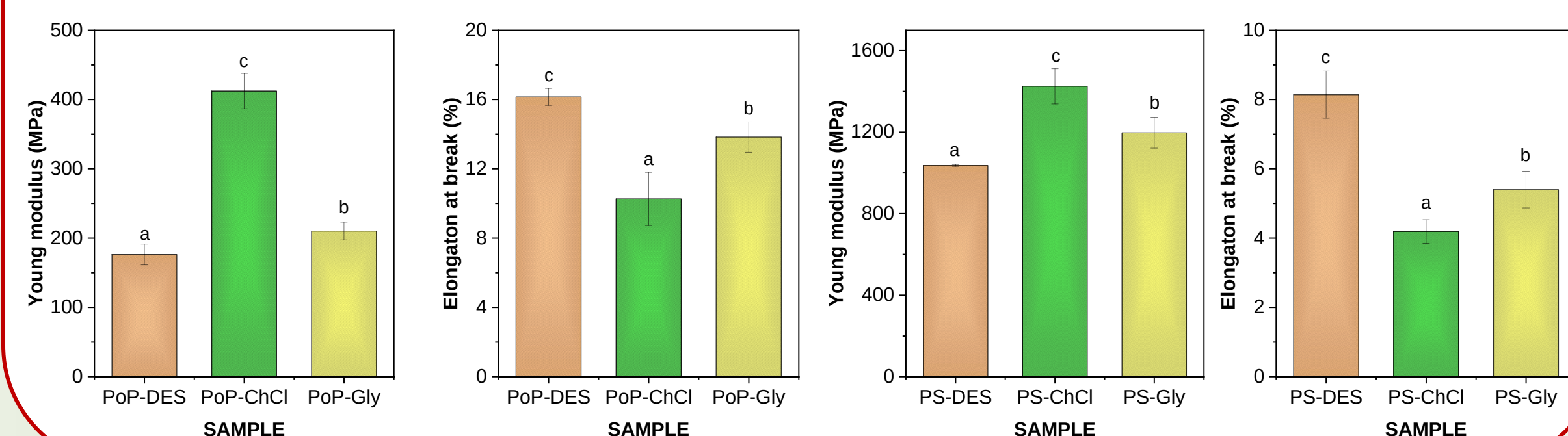


XRD Spectra



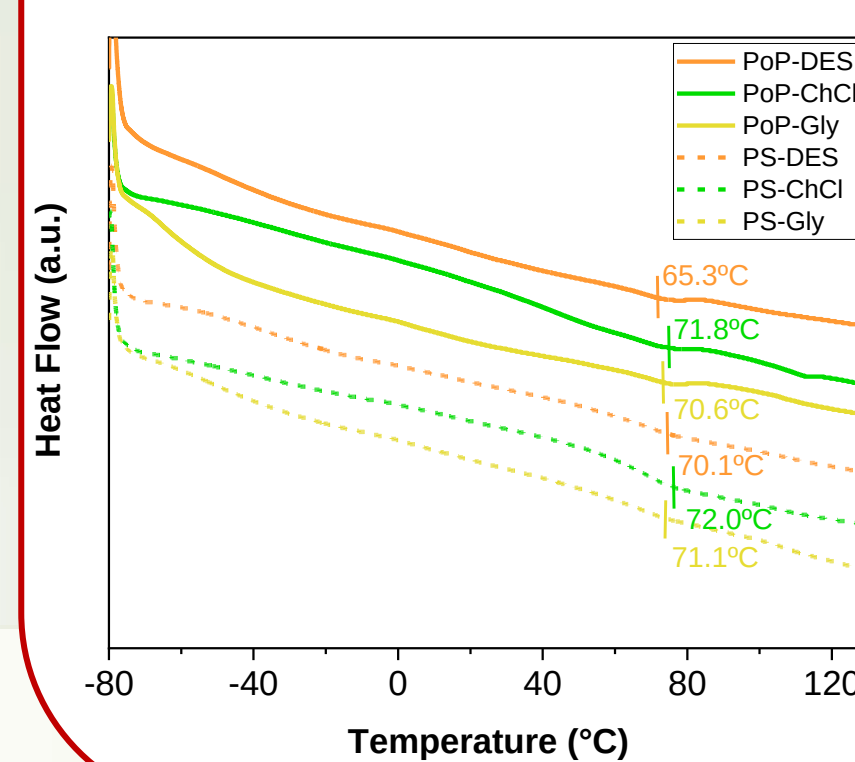
4.3 Mechanical properties

Stress-Strain Characteristics

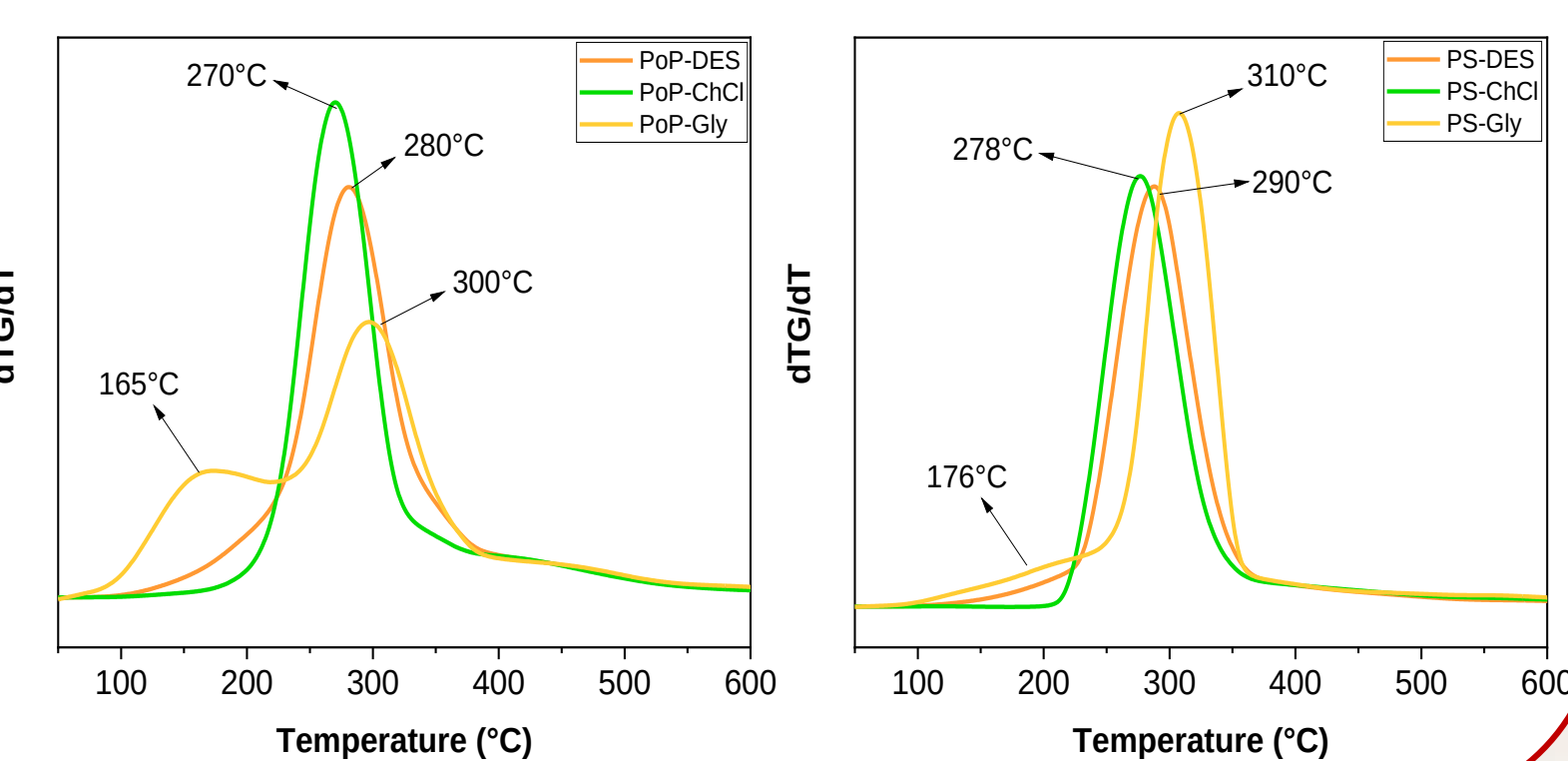


4.4 Thermal behaviour

DSC Curves

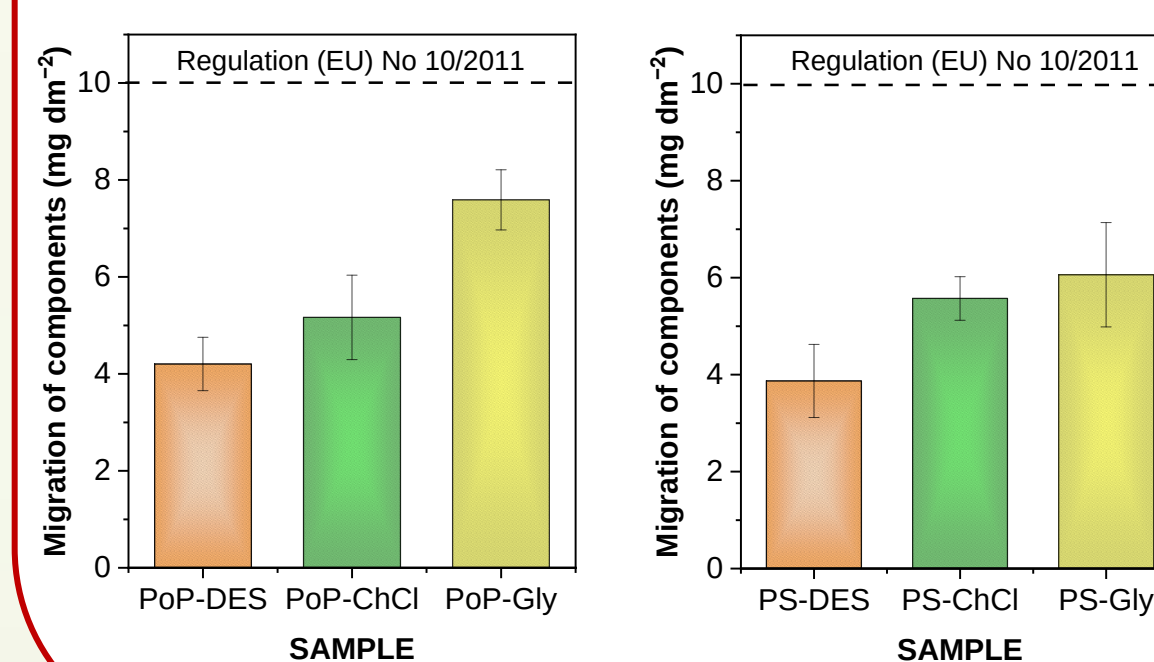


dTGA Curves

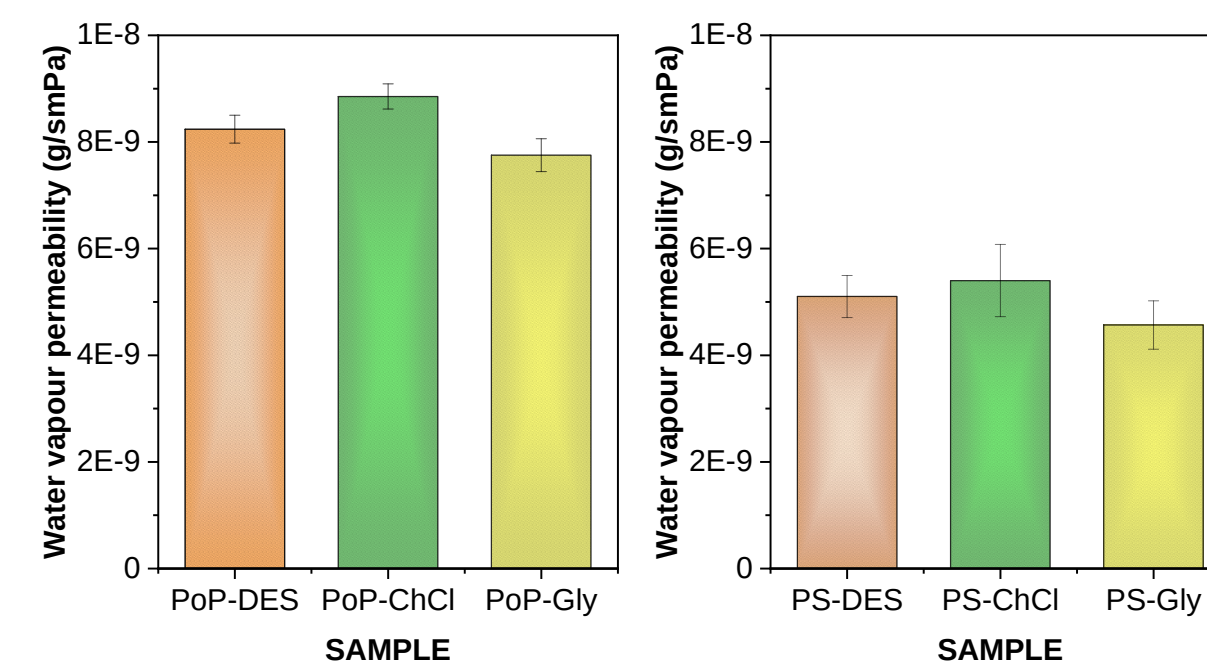


4.5 Overall migration of components in food simulant and barrier properties

Overall migration in TENAX®



Water Vapour permeability



CONCLUSION

The results indicate that the use of DES notably improves the plasticization of PoP and PS, resulting in flexible, homogeneous bioplastic films. These findings highlight the promising potential of PoP-based bioplastics as sustainable alternatives to conventional packaging materials, contributing to the advancement of circular economy practices and the efficient valorization of agro-industrial waste.

REFERENCES

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- Zhao, Q., Huang, X., Qian, L., Sun, N., Yang, J., Wen, J., ... & Qin, Z. (2025). Food Hydrocolloids, 160, 110752.

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