Preparation of biobased recyclable polymers from a mixture of cardanol-cardol

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Introduction

Cashew nutshell (CNS) is a waste product of the cashew industry, with 2 million tons generated worldwide in 2017. CNS contains 30-35% cashew nutshell liquid (CNSL), which is rich in compounds such as cardanol and cardanol [1]. This study aims to synthesize a bio-based recyclable polymer from a mixture of cardanol and cardanol (CAO).

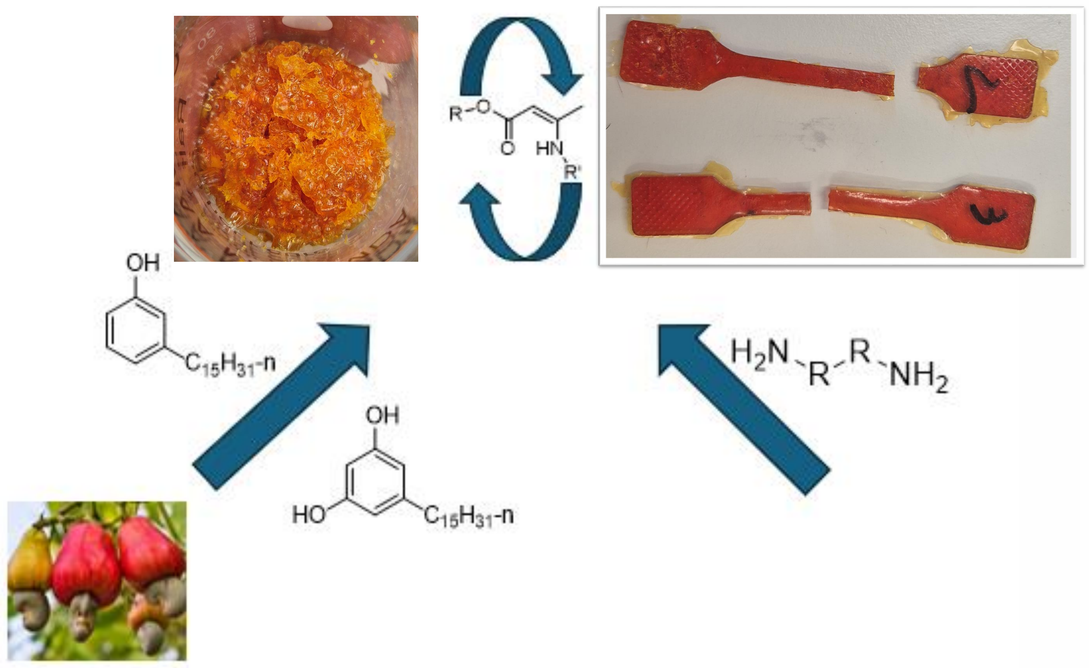

Figure 1 From cashew nutshell liquid to the biobased recyclable polymer

Reaction scheme

Cardol-cardanol mixture modification

The cardol and cardanol were modified under UV light to form polyols.

These polyols were reacted to prepare the acetoacetate monomers.

Hardening

The acetoacetate monomers were crosslinked with amines to form the polymers.

Polymer characterisation

The polymers were hot-pressed and characterized using FTIR, DSC, TGA, and tensile tests

Results

The prepared polymer is a glassy and rigid material with a Tg of 48°C. In FTIR spectroscopy (Figure 2), the appearance of the urethane signal at 1649 cm-1 and 1597 cm-1 confirms the formation of the polymer.
It showed good thermal stability with an initial decomposition temperature of 242.5 ◦C, a high gel content of 87%, and a tensile strength of 17.1 Mpa.

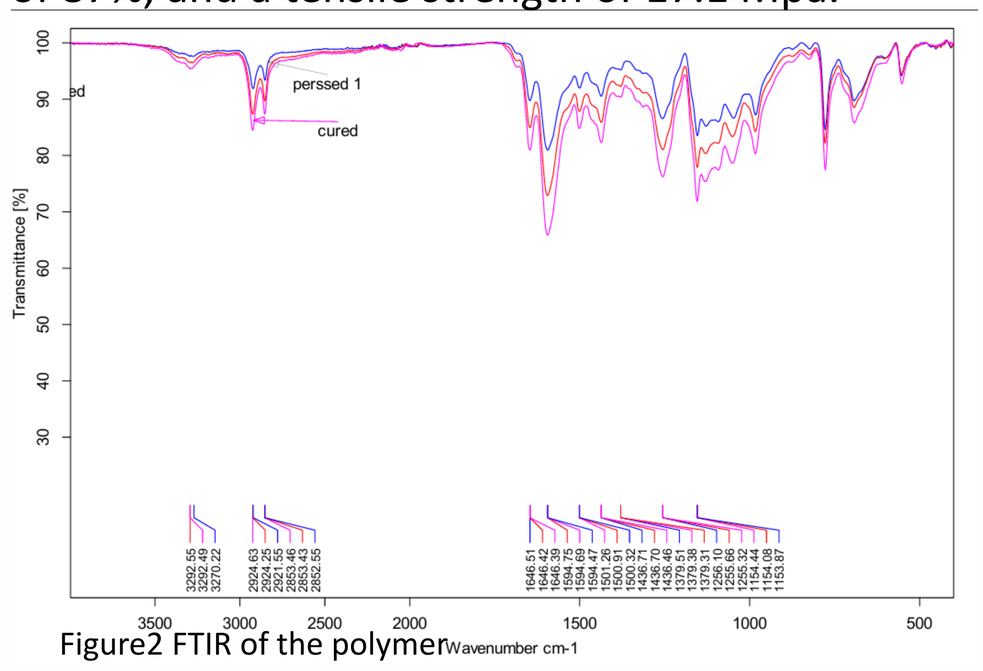

Figure2 FTIR of the polymer

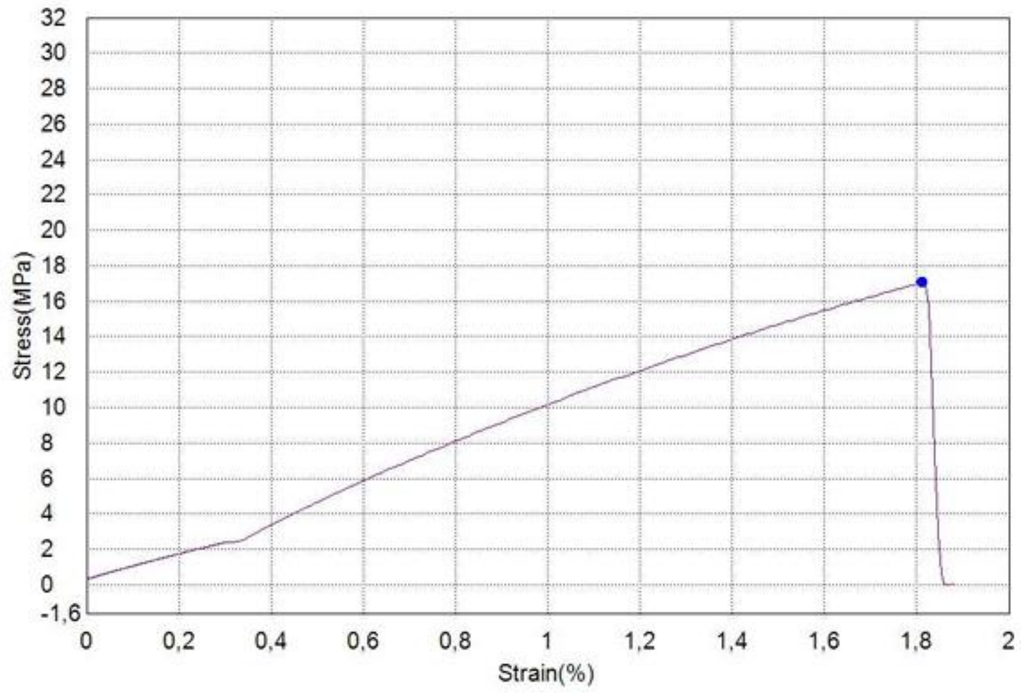

Figure 3 polymer stress-strain curve from the tensile test

Conclusion

A bio-based recyclable polymer was successfully prepared from a mixture of cardanol and cardanol (CAO), a waste product of the cashew industry. The polymer had a final tg of 38,5^{o}C and showed good thermal stability with an initial decomposition temperature of 242.5, a gel content of 87%, and the tensile strength of 17.1 Mpa. Future research needs to test the recyclability of the polymer.

References

[1] A. Global, 2024. [Online]. Available: https://www.cbi.eu/market-information/processed-fruit-vegetables-edible-