Structured lipids produced from palm-olein oil by interesterification: A controllable lipase-catalyzed approach in a solvent-free system

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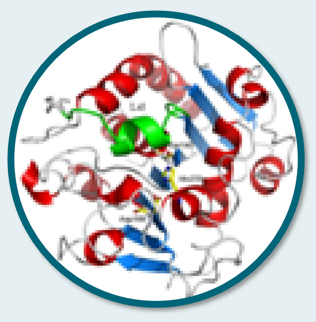
BACKGROUND



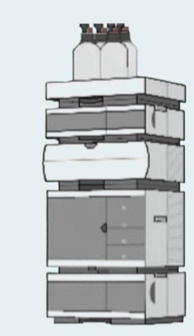
With the use of interesterification, edible fats and oils can be altered to enhance their physicochemical characteristics and improve their nutritional value, further extending their applications in food production[1].

Theoretically, the sn-1,3-specific lipase acts specifically upon the hydrolysis of fatty acids located at the sn-1 and sn-3 positions. However, it was found that the content of sn-2 saturated fatty acids in POL increased after interesterification by Lipozyme TLIM, and the extent of increase was influenced by reaction time and temperature[2].

METHODS

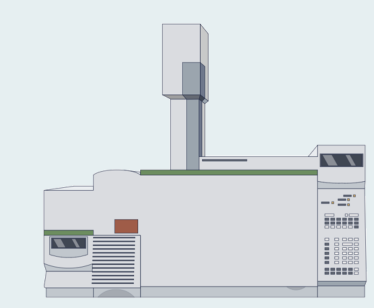
This study aims to provide a comprehensive analysis of the physicochemical changes before and after POL modification.

- Thermodynamic behavior
- Crystallization rate
- Solid fat content
- Crystal microstructure
- Crystal polymorphism change
- Hardness change



HPLC-Q-TOF-MS/MS

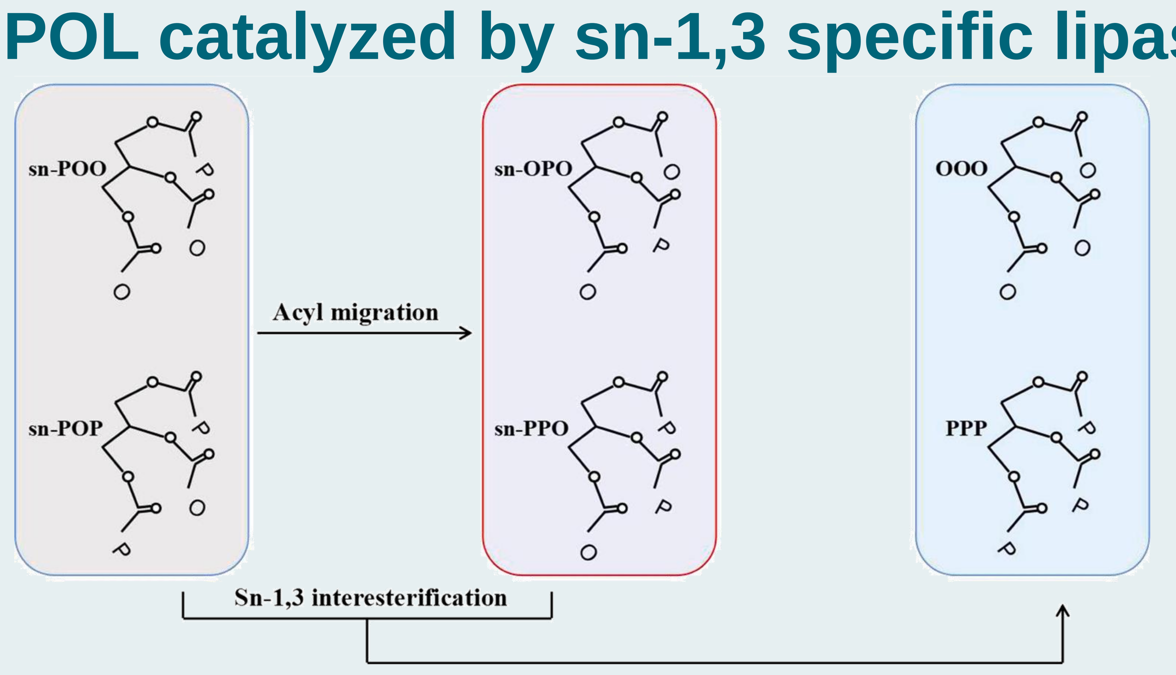
NMR



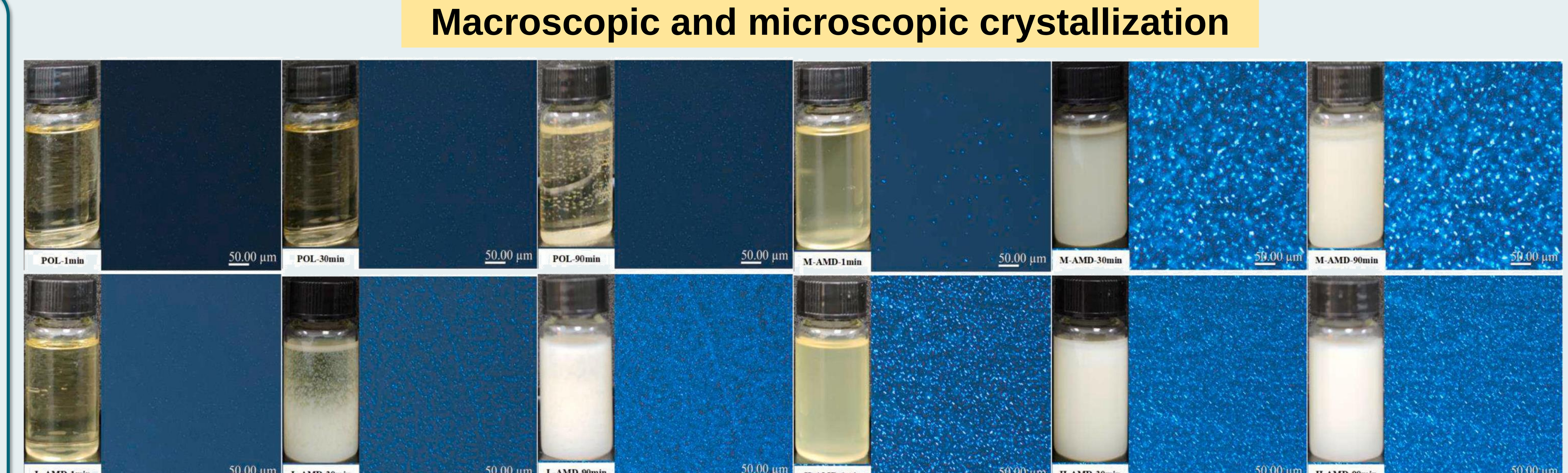
GC-FID

RESULTS

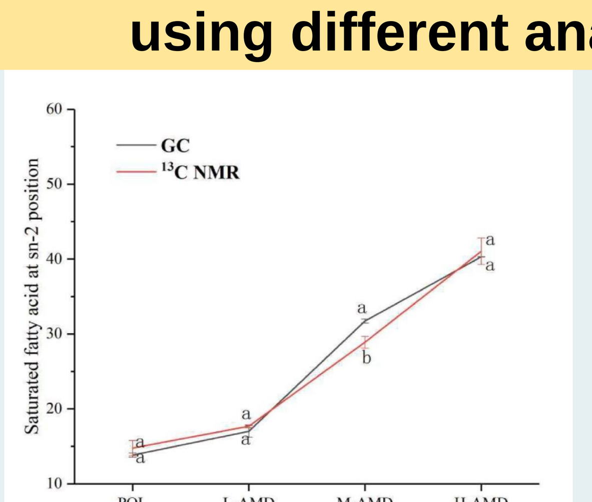
The enzymatic interesterification scheme of POL catalyzed by sn-1,3 specific lipase

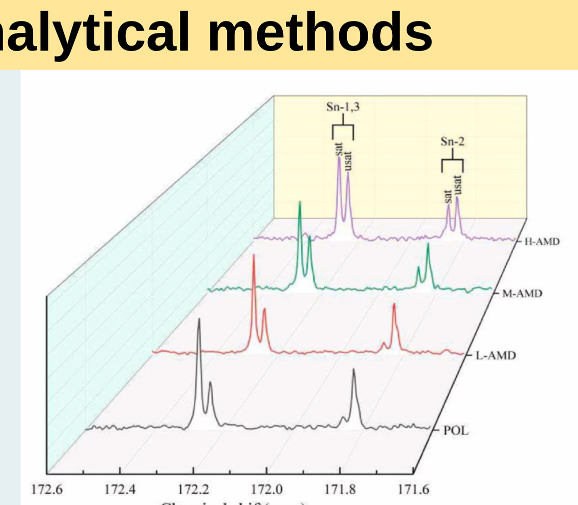


Macroscopic and microscopic crystallization

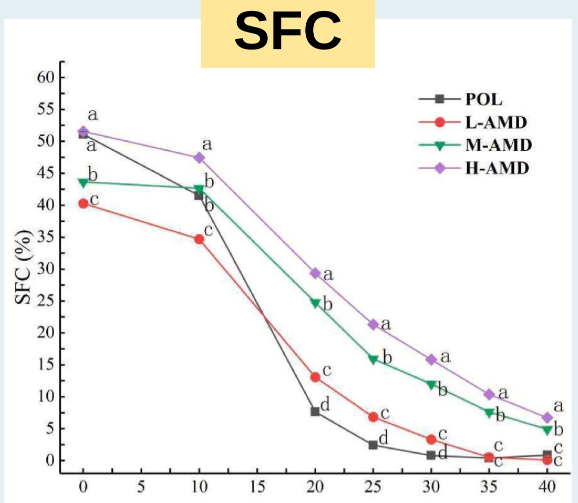


Comparison of sn-2 saturated fatty acid content using different analytical methods

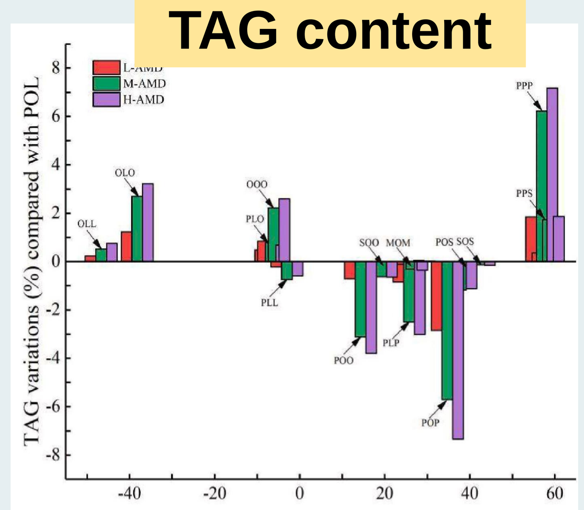




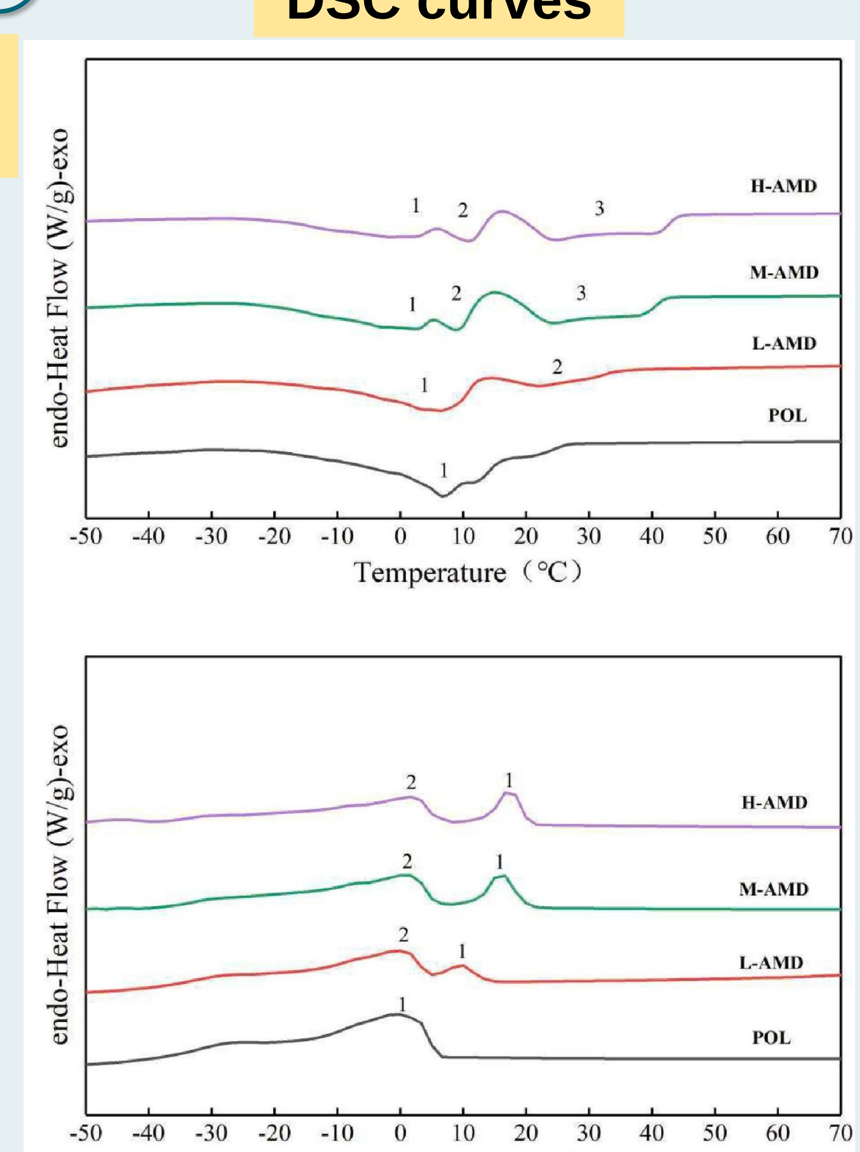
SFC



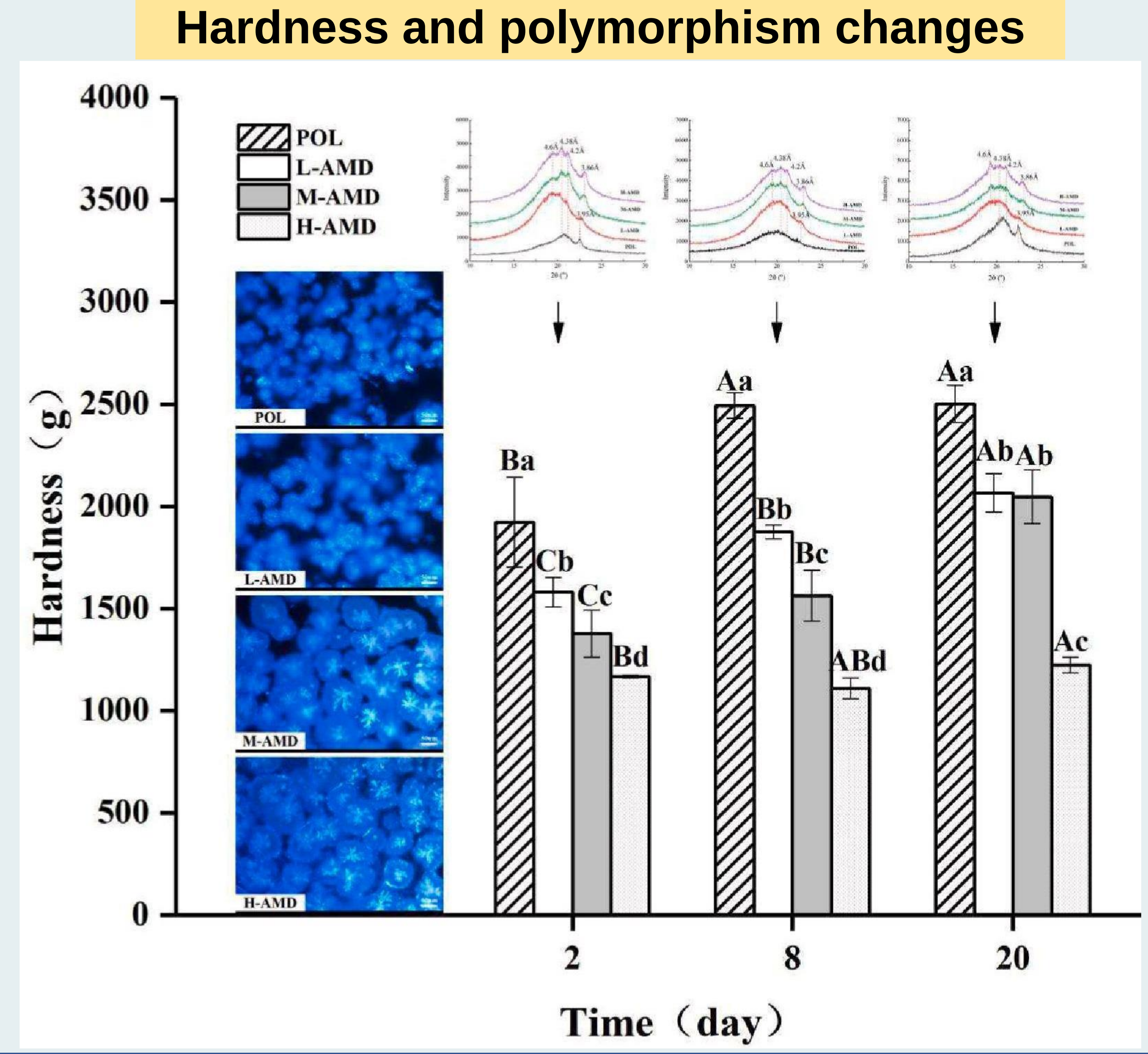
TAG content



DSC curves



Hardness and polymorphism changes



CONCLUSION

❶ *Sn*-POP and *sn*-POO migrated into *sn*-PPO and *sn*-OPO simultaneously during enzymatic interesterification.

❷ After modification, the content of PPP-type TAG increased, resulting in a shortened nucleation induction time, accelerated crystallization rate, and a wide plastic region.

❸ Acyl migration accelerated the transformation of the β’ form to the β form during storage, which led to post-hardening of the modified POL.

Reference

[1] Kadhum, A. A. H., & Shamma, M. N. (2017). Critical Reviews in Food Science and Nutrition, 57(1), 48–58.

[2] Zhou, H., Zhang, Z., Lee, W. J., Xie, X., Li, A., & Wang, Y. (2021). Lwt-Food Science and Technology, 142, 111023.

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