UNIVERSIDADE FEDERAL DE SANTA CATARINA

cbecimat26
26° Congresso Brasileiro de Engenharia e Ciência dos Materiais

22 a 26 de novembro de 2026
Costão do Santinho
Florianópolis-SC

LABMAT
Materials Laboratory

Evaluation of the Rheological Behavior of Feedstocks Used in Metal Additive Manufacturing via Robocasting

Millene Abreu Pauli[1]; Bruno Hotza[1]; Felipe Gonçalves Jedyn[2], Rodrigo Perito Cardoso[1]

1. Labmat - Universidade Federal de Santa Catarina; 2. Universidade Tecnológica Federal do Paraná

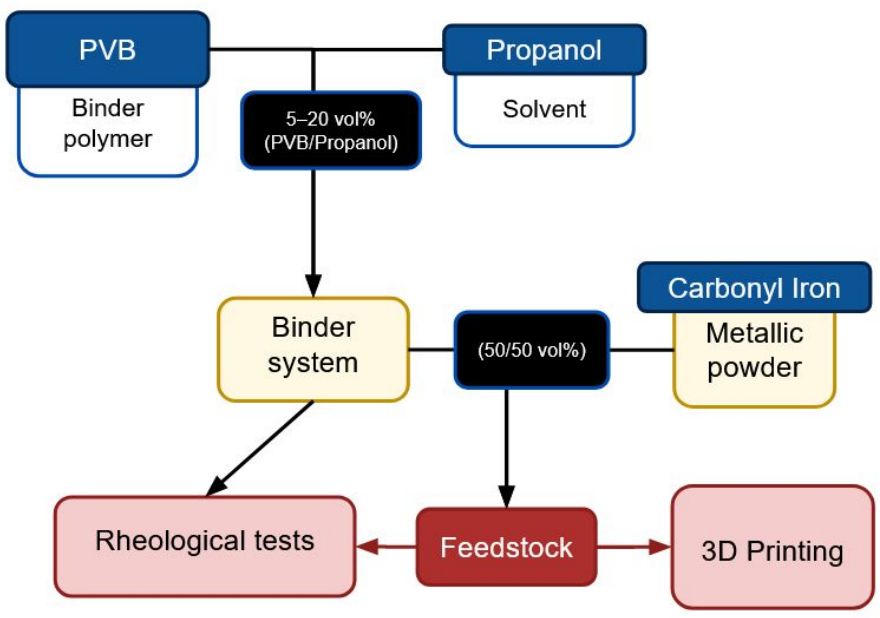
Introduction

Robocasting is an additive manufacturing technique based on the controlled extrusion and deposition of feedstocks, which consist of highly concentrated suspensions of metallic particles in a binder system composed of a solvent and a polymeric binder [1,2]. To ensure efficient printing, feedstocks must exhibit shear-thinning behavior, in which viscosity decreases under high shear stress [3].

Objectives

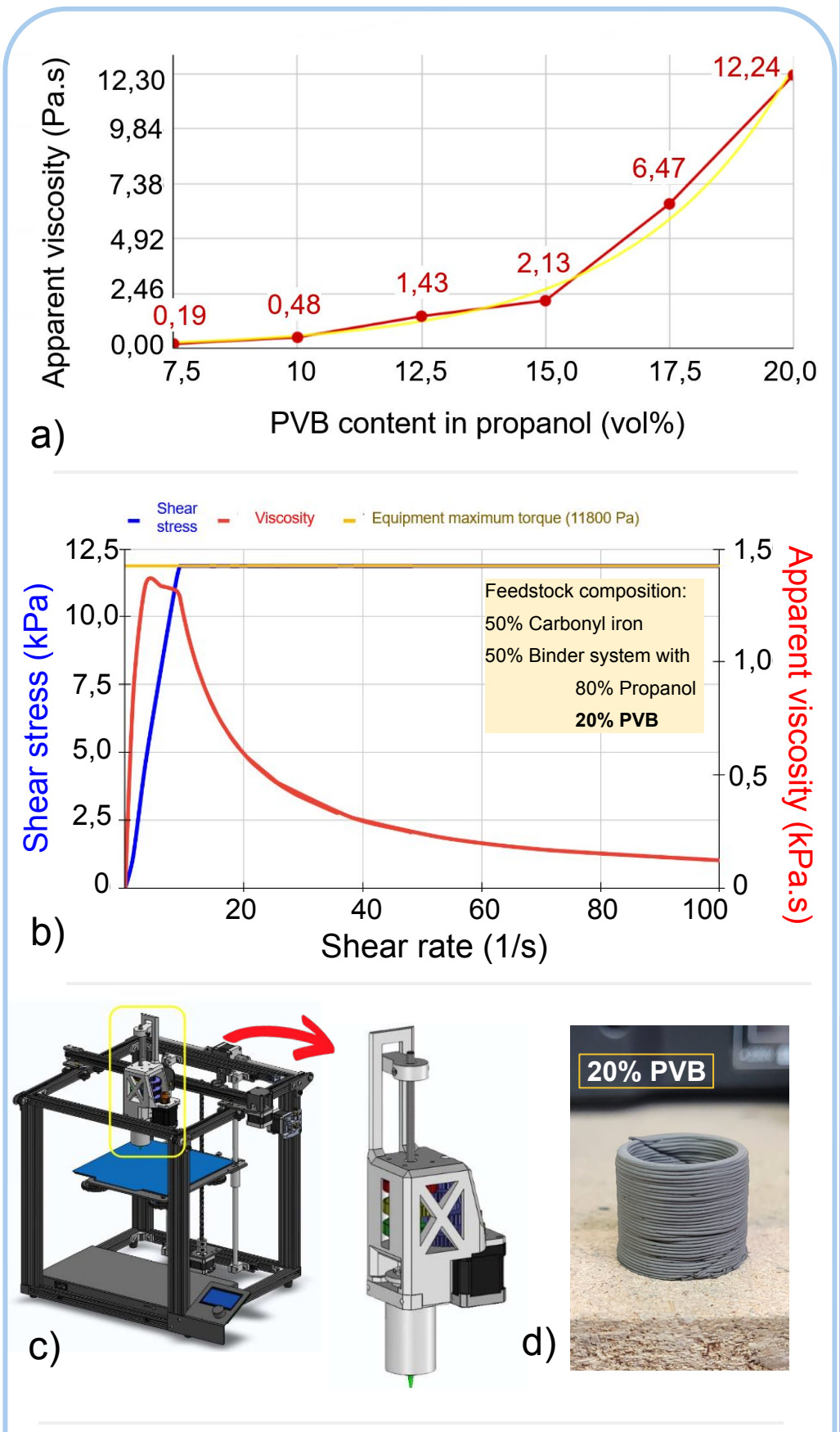
To evaluate the effect of polymer content on the rheology of robocasting binders and feedstocks.

Methodology



Results and discussion

- Increasing the PVB content in the binder system significantly increased viscosity, which was attributed to greater structuring of the polymer matrix.
- Feedstocks with lower PVB contents exhibited Newtonian fluid behavior, whereas the feedstock with the highest PVB content exhibited shear-thinning behavior, which is considered desirable for Robocasting applications.



a) Increase in viscosity caused by increasing PVB content in binder system samples b) Shear-thinning behavior exhibited by the 20% PVB feedstock; c) 3D printer adapted for robocasting d) a part printed using the 20% PVB feedstock.

Conclusion

This study identified that the polymer content in the binder system is the primary factor determining the rheological behavior of the pastes, directly influencing their suitability for use as feedstocks in Robocasting.

References

[1] LAMNINI, S. et al. Robocasting of advanced ceramics: ink optimization and protocol to predict the printing parameters – A review. Heliyon, 2022.
[2] OLIVER-URRUTIA, C. et al. Robocasting additive manufacturing of titanium and titanium alloys: a review. Trans. Indian Inst. Met., 2023.
[3] SMAY, J. E. et al. Colloidal inks for directed assembly of 3-D periodic structures. Langmuir, 2002.

Acknowledgments

The authors thank the financial support provided by CAPES and CNPq, and the analyses conducted at VITROCER - UFSC.