



XXXII **B-MRS** **2024**
Meeting
September 29th to October 3rd

PROCEEDINGS

Sociedade Brasileira de Pesquisa em Materiais

**Proceedings of the XXII
B-MRS Meeting**

Santos, SP 2024

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ISBN: 978-85-63273-63-5

Synthesis of bio-based polyurethanes using cellulose and lignin as polyols with simultaneous film formation: incorporation of SiO₂ nanoparticles for antibacterial properties

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In the past few decades, there has been a growing interest in using lignocellulosic biomass to develop sustainable materials that can replace those made from fossil sources. Under this scenario, this study aimed to synthesize bio-based polyurethanes with simultaneous formation of films with SiO₂ nanoparticles incorporated, looking for antibacterial properties^[1]. Renewable polyols sources such as castor oil, microcrystalline cellulose^[2], and kraft lignin^[3] were used along with an isocyanate resin. SiO₂ nanoparticles formed from a biotechnological route were incorporated into the films by adding them to the reaction mixture while stirring or using an airbrush right after the reaction mixture was spread on a glass plate. Neat films were formed for comparison purposes. The films were characterized via infrared spectroscopy, thermogravimetric analysis, tensile properties, contact angle, and antibacterial properties. This study is in progress, and preliminary findings have demonstrated good properties and identified the direction to be pursued to enhance antibacterial activity.

Acknowledgements:

CNPq (National Counsel of Technological and Scientific Development, Brazil): research productivity fellowship to E.F., financial support (Process n° 403494/2021-4), and fellowship from the Institutional Scientific Initiation Scholarship Program (PIBic) to D.B.P.

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