

Effect of Nanofibrillated Cellulose Loading on the Rheological Behavior of Liquefied Wood - Polyurethane Based Coatings

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INTRODUCTION

LW based coatings are prepared from renewable sources.¹ However, some drawbacks of LW based wood coatings, like low stability in humid conditions, hinder their further development into commercial products.² So, in our preliminary investigation, the nanofibrillated cellulose (NFC) was introduced into the LW based systems, in order to enhance the properties of LW-PU surface systems.

EXPERIMENTAL

Liquefaction of wood dust (poplar and spruce) was performed with glycerol, in the presence of H₂SO₄ as a catalyst.

The ratio between hydroxyl number of the LW and -NCO content in the Desmodur L75 was 1:1.2. The nanofibrillated cellulose was added on the 3 wt% of LW and the curing and rheological properties of the new LW-PU-NFC system were studied.

The viscoelastic and curing behavior of a commercial PU, LW-PU and LW-PU-NFC samples was determined using an ARES G2 rheometer (TA instruments) equipped with 25 mm parallel-plate configuration.

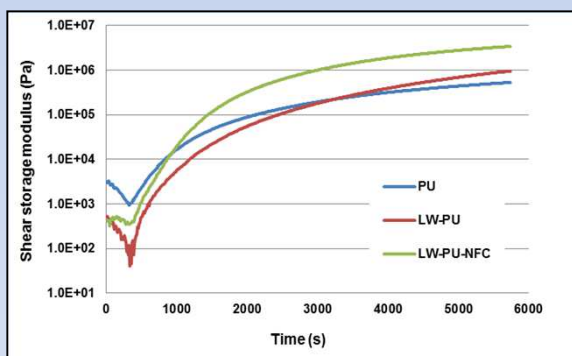


Fig 1: Storage modulus of samples curing at 90 °C.

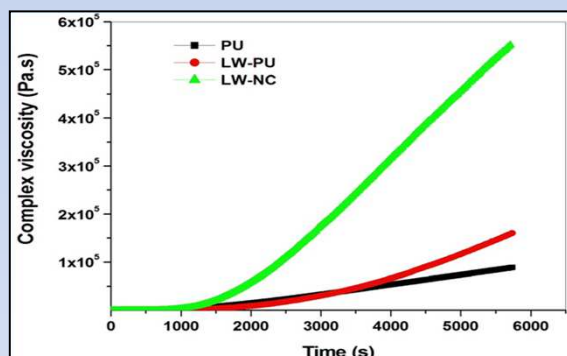


Fig 2: Complex viscosities of samples curing at 90 °C

In conclusion, this was the preliminary study to investigate effect of nanocellulose on the rheological properties of LW-PU coatings and comparison with commercial PU. The viscoelastic property in the form of the storage modulus, and complex viscosity improved significantly with the NFC addition.

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[2] Budija F., Tavzes Č., Zupančič-Kralj L., Petrič M., (2009), Self-crosslinking and film formation ability of liquefied black poplar. Bioresource Technol., 100: 3316-3323.