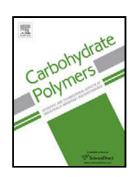
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ACCEPTED MANUSCRIPT

1 Rheological properties of micro-/nanofibrillated cellulose suspensions: wall-slip

2 and shear banding phenomena

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13 Abstract

14 The rheological properties of enzymatically-hydrolyzed and TEMPO-

15 oxidizedmicrofibrillated/nanofibrillated cellulose (MFC/NFC)aqueoussuspensions wereinvestigated

16 in oscillation and steady-flow modes and were compared with the morphology of the studied

17 materials. The flow instabilities, which introduce an error in the rheological measurements, were

- 18 discovered during flow measurements. Awall-slip (interfacial slippage on the edge of geometry
- 19 tools and suspension)was detected at low shear rates for two types of NFC suspensionswhile

20 applying cone-plate geometry. A roughening of the tool surfaces was performed to overcome the

- 21 aforementioned problem. Applying to TEMPO-oxidized NFC, a stronger suspension response was
- 22 detected at low shear rates with higher values of measured shear stress. However, a shear banding
- 23 (localization of shear within a sample volume) became more pronounced. The use ofserrated
- 24 toolsfor enzymatically-hydrolyzed NFCproducedlower shear stress at the moderate shear rates,
- 25 which was influenced by water release from the suspension.
- 26 Keywords
- 27 Rheology,nanofibrillated cellulose (NFC), microfibrillated cellulose (MFC), cellulose
- 28 nanofibers (CNF), wall-slip, shear banding
- 29 **1 Introduction**

30 The use of nanocellulose has gained much interest lately, especially in such areas as

- 31 composites, packaging, adhesives, biomedicine, automotive etc. Since it is a renewable and
- 32 biodegradable material, possessing specific properties, it has a great potential for industrial
- 33 application.

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