Microfibrillated Cellulose for the Reinforcement of Virgin and Recycled Cellulosic Yarns

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INTRODUCTION

The focus of this research is to enhance the mechanical properties of cellulosic yarns by reinforcement with microfibrillated cellulose (MFC). MFC plays a competitive role as a sustainable reinforcement material, replacing the non-biodegradable, petroleum-based materials used in textile processing today [1]. Enhancing the mechanical properties of cellulosic yarns will expand their applications in high-performance textiles [2].

INITIAL RESULTS

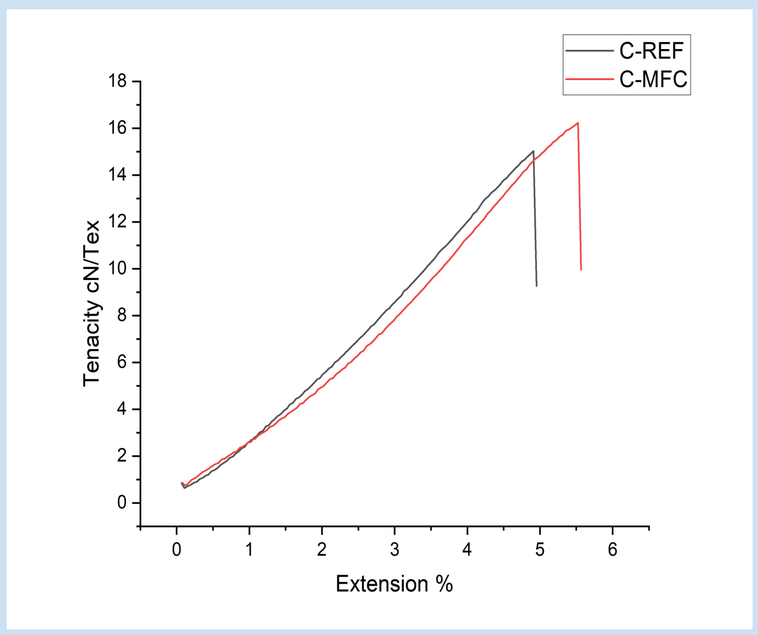


Fig.3: Tenacity-Extension curve of: cellulosic yarn reference (C-REF) and Cellulosic yarn coated with 1.1wt%MFC (C-MFC).
MFC's coated yarn exhibited an increase in linear density from 40 to 41 Tex, an 8% increase in tenacity from 15 to 16.2 cN/Tex, and a 13.2% increase in elongation from 4.9% to 5.5% relative to the reference yarn.

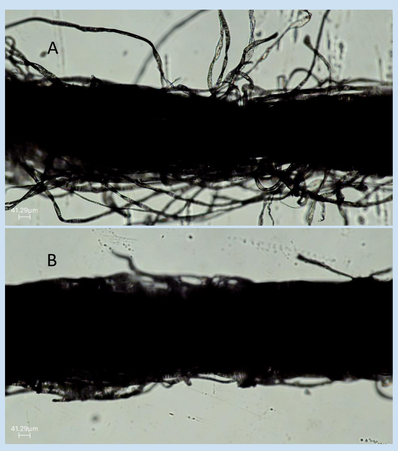


Fig. 4: A – a section of cellulosic yarn before coating with MFC, B – a section of cellulosic yarn coated with MFC.
Coating the yarn with MFC reduces the hairiness of the cellulosic yarn.

MATERIALS AND METHODS

Microfibrillated cellulose (MFC), marketed under the trade name Celova 250, was obtained from Weidmann Fiber Technology in Switzerland (Fig.1). MFC was supplied as a gel containing 2 wt.% solids with pH =7 and an average particle length of 8 µm. Cellulosic yarns with 40 Tex were used and dip-coated with MFC.

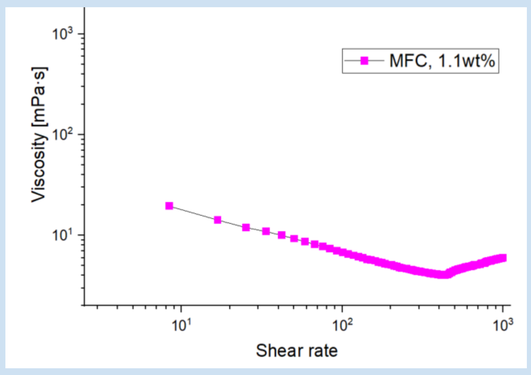
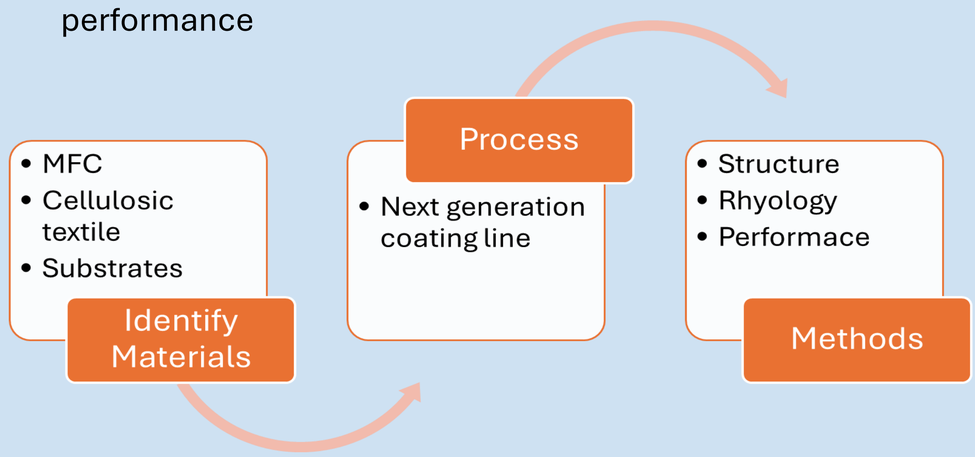


Fig. 1: Viscosity curve of Celova250 1.1 wt% solid.
MFC suspension exhibits a shear-thinning behavior.

Fig. 2: MFC – Celova 250-gel 2 wt% solid.

FUTURE WORK

Future work will select suitable MFC, cellulosic textiles and substrates, apply next-generation coating, and link coating structure and rheology to final performance



ACKNOWLEDGEMENT

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2. Dai, Dasong, and Mizi Fan. "Green modification of natural fibres with nanocellulose." *Rsc Advances* 3.14 (2013): 4659-4665.

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