CELLFIL – CELLulose lyocell FILaments as a scalable solution for circular textile production Development of fancy lyocell yarns and flat knitted samples

Madita Fischer*[1], Kerstin Greul[1], Karin Ratovo[1], Kristina Klinkhammer[1], Boris Mahltig[1], and Ellen Bendt[1]

[1]Hochschule Niederrhein, Faculty of Textile and Clothing Technology – Germany

Abstract

Aim of the CELLFIL project is the production, optimization, and processing of cellulosic Lyocell filaments Yarns (LFY) from renewable and alternative raw materials. New raw material sources are identified and suitable production conditions for LFY are validated. Lyocell, a regenerated cellulose fiber, is considered a promising alternative for sustainable textile applications.
The current study focuses especially on flat-knit developments based on the production of fancy yarns. The systematic investigation of the transferability of established yarn concepts to LFY is essential, particularly as its smooth fiber surface presents challenges in yarn formation. In addition, the resulting mechanical and fabric-related properties are analyzed. Various yarn structures (ring-spun yarns and different types of covered yarns) in a range between Nm 2,5 and Nm 9 for different applications (apparel and home textiles) are produced under defined process parameters and mechanically characterized. Scanning electron microscopy (SEM) is employed to examine fiber and yarn morphology. Based on the developed yarns, knitted fabrics are manufactured and evaluated with respect to handle, dimensional stability, washing behavior, and printability.

The results demonstrate that conventional yarn concepts can be transferred to LFY, but require targeted adaptation of yarn structures. Fabric investigations reveal a direct correlation between yarn structure and resulting fabric properties.

Overall, the findings confirm the potential of Lyocell filaments for sustainable textile applications within the CELLFIL project and provide a solid basis for the targeted optimization of yarn and fabric structures in the context of a circular textile economy.
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them. Grant agreement ID: 101135042

Keywords: Lyocell, cellulosic filaments, sustainable textiles, fancy yarns, flat knitting, yarn structures, covered yarns, knitted fabrics, mechanical properties, circular textile economy

*Speaker