Project Title:	CO_2-based Thermoplastics in Textile Applications (CO_2Tex)
Funded Partners:	W. Zimmermann GmbH & Co. KG, Weiler-Simmerberg medi GmbH & Co. KG, Bayreuth Schill+Seilacher GmbH, Böblingen Oerlikon Textile GmbH & Co. KG, Remscheid Carbon Minds GmbH, Köln adidas AG, Herzogenaurach Institut für Textiltechnik der RWTH Aachen University, Aachen
Period	11/2021 – 10/2024
Funding	BMBF, Innovation Space “BioTexFuture”

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Mission Statement

The exhaust gas carbon dioxide (CO_2) is an abundant, sustainable and, in comparison to many biogenic raw materials, inexpensive feedstock for the production of polymers. Technologies exist for utilizing CO_2 to produce polyols that can be used in thermoplastic polyurethanes (TPU). First elastic filament yarns from these CO_2-TPU could already be spun on pilot scale and transferred to textile applications. However, the developed yarns have a particular tackiness, which still poses challenges in further processing and thus makes industrialisation difficult. The global market for elastic filaments will grow at a rate of 8 % per year and is expected to reach a volume of 1.5 million tonnes by 2023. Elastic filaments are used in 80 % of all clothing products and are thus a globally significant economic factor for the textile industry.

Aim

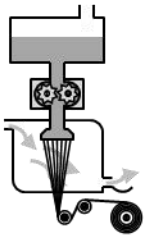
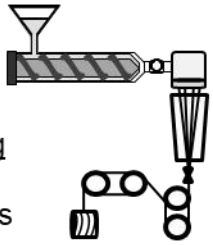
The aim of the project is the establishment of commercially viable elastic filament yarns made from CO_2-containing TPU. At the end of the project, these yarns should be processed as easily as possible in existing industrial plants into textile pre- and end products.

Approach

In order to develop a stable and reproducible melt spinning process for TPU yarns containing CO_2, modifications are being made to spinning plants. These include the investigation of spinnerets, filament cooling, godet surfaces and winding technology. In addition, spin finishes are adapted to the process and tested. The developments are scaled up from pilot to industrial scale. If the production of suitable yarns is possible, the process chain for the

production of sports and medical textiles is investigated and adapted. This includes the processes of covering, knitting and finishing. Finally, the use of TPU yarns containing CO_2 is evaluated ecologically and economically.

CURRENT STATUS OF ELASTIC YARN PRODUCTION:

State of the Art		Target of CO_2Tex	
Dry Spinning > 99 % of all PU-Filaments, CAGR: ~ 8 %, 2020: 1.22 MT		Melt Spinning TPU-Filaments	
max. 1,000 m/min Costs for Solvents (~ 2 €/kg DMF) Solvent Recovery		min. 2,500 m/min No Costs for Solvents No Solvent Recovery	

MAIN DEFICIT: HIGH SURFACE TACKINESS OF YARNS HAMPERS FABRIC PRODUCTION

APPROACH: MODIFICATION OF MELT SPINNING PLANTS AND PROCESSES


SPINNERETS


COOLING OF FILAMENTS


WINDING TECHNOLOGY


GODET SURFACES


SPIN FINISHES

PROJECT COURSE:


MELT SPINNING PROCESS & FILAMENTS


COVERED YARNS


FABRICS


PRODUCTS


LCA

RESULT:: CONCEPT FOR A MELT SPINNING PLANT ON TRL 8 TO 9

Acknowledgement

We would like to thank the German Federal Ministry of Education and Research for funding the research project within the innovation space “BioTex-Future” (funding code: 031B1207A).

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