

Application of CO₂-containing Thermoplastic Polyurethane Yarns in Elastic Textiles

Abstract:

The market volume of elastic yarns has grown massively over the past years, mainly driven by applications in apparel, sports and medical textiles due to world-wide population growth and demographic transistion. For example, ca. 80 % of all currently circulated apparel textiles world-wide contain elastic yarns to provide stretch and comfort. Most of these elastic yarns are produced by dry spinning of thermoset polyurethanes (PU) which causes specific challenges: Production is slow as well expensive and potentially hazardous solvents have to be used. Switching from dry to melt spinning processes offers the opportunity to overcome these challenges.

Thermoplastic polyurethanes (TPU) fulfil the needs of high elasticity and melt spinability by being structured in hard and soft segments. Additionally, the greenhouse gas CO₂ can be used as one of the resources for TPU production. By this, “Carbon Capture and Utilization” (CCU) can be applied in the textile industry.

Main obstacle to the industiral use of melt-spun CO₂-containing TPUs is currently a strong surface tackiness of these yarns which hampers in particular unwinding from bobbins and transportation through machines for fabric production. Means to reduce this surface tackiness are mandatory for the industrial upscale and include modifications of melt spinning plants as well as the development of suitable auxiliaries such as demand-oriented spin finishes.