

"Mechanism of Fiber Assembly in Friction Spinning System"

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In recent years, the friction spinning system has become attractive because of high productivity and the possibility of automation. This system usually consists of two cylinders rotating in same direction and fibers are fed into the nip of these rollers. A friction yarn is formed by the torque which is generated by the frictional force between the yarn surface and moving cylinders.

In this study, the spinning performance of a core-type friction system is presented to determine the operating limits and optimum conditions. Based on the interaction of machine variables, i.e., core/sheath fiber population ratio and twist parameter, the fiber assembly structure and the physical properties of the yarn produced are described. It has been found that the friction yarn was formed with disorderly sheath fibers which had variable and unstable twist angles.

By application of a short-duration flash photographic technique, the varying twist distribution along the fiber assembly zone during the yarn formation process was determined to explain the mechanism of torque generation in a core-type friction spinning system. It was shown that the

torque level was highly non-uniform along the friction zone and there were two sources of instability the core yarn arising from torsional buckling and surges of twist in the yarn.

The behavior of sheath fibers in the transfer duct is important. It was found that the fiber-flow pattern in the sheath fiber channel was variable locally and the sheath fibers were significantly decelerated from the nip of the comber rollers to the fiber assembly zone.

Finally, it was found that the surface fiber disorder in the yarn was strongly dependent on two machine features; the air-flow pattern in the fiber transfer duct and the torque distribution along the fiber assembly zone. The factors which gave the surface fiber disorder in the yarn are explained.