

Study on structure and properties of ptt fiber and spinning feasibility of ptt sh...



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PTT (Polytrimethylene terephthalate) fiber is a kind of the most important fibers of the after-polyester period. With the development of economy, people's living standard is improving. More and more consumers hope that in the field of clothes and articles for daily life, high performance fabric can be conducted. Compared with other traditional chemical fibers, PTT fiber has the following characteristics: moderate glass transition temperature (T_g) and initial young's modulus, excellent softness and elastic recovery; excellent wrinkle resistance; good dimension stability; excellent dyeability; good chemical stability and low absorbance.

PTT fiber possesses many advantages of most synthetic fibers, and the most significant one is its excellent elastic recovery. And the workability, mechanical properties, thermo plasticity, extensibility, high elasticity, size-stability and dyeability of PTT is superior than PET, PA, which can also be widely applied on engineering plastic, thin film and other area. PTT (Polytrimethylene terephthalate) cut fiber can be widely used as a substitute for spandex which is of high price, big investment, and complicated spinning process.

Among the synthetic fibers, polyester becomes the first breed of synthetic fiber because of its excellent performance and lower price. PET and PBT have already been industry produced and the widely used PTT cut fiber integrate the rigidity of PET and suppleness of PBT. Its elasticity is lower than that of spandex but higher than that of PET. It's a pity the research is limited on the pivotal properties in the processes of dyeing and finishing, as well as the theoretical research on the dyeing mechanism of disperse dye in PTT fiber.

In the first part of this thesis, three issues will be investigated as follows: the effect of temperature and the tension of heat treatments on structure and mechanical properties of PTT fibers, the effect of chemical treatments on structure and mechanical properties of PTT fibers, also the dyeing behavior of PTT fibers with disperse dyes. In this research, SEM, ATR, XRD, DSC will be used to study the morphological and microstructure and properties of PTT fibers.

The basic physical properties of PTT fiber before and after treatment will be tested. The second part of this paper mainly focuses on spinning feasibility of PTT short fiber and the property of corresponding fabric. The elongation of PTT will be tested and it should be compared with that of PET. The suitable model which is used to describe the stress relaxation of PTT should be established. And we should get the relation between strain-stress and time.

It's necessary to test doff transfer rate of the carding machine, analysis the force exerted on the fiber under carding process, and then calculate the front angle of wire clothing on the cylinder. We should try to find the critical twist factors by way of twisting and untwisting. By adjusting the density of fabric, finishing temperature and dyeing condition, the factors that affect the fabric's elasticity will be found out.