Material Name: Polyester

Origin and Characteristics:

Polyester fiber, commonly known as "polyester". It is a synthetic fiber made by spinning polyester made from polycondensation of organic diacid and diol, short for PET fiber, which belongs to high molecular compound. Invented in 1941, it is currently the largest variety of synthetic fiber. The biggest advantage of polyester fiber is wrinkle resistance and shape preservation is very good, with higher strength and elastic recovery ability. Its firm durable, anti - wrinkle and non - ironing, non - sticky hair.

Polyester (PET) fiber is a kind of synthetic fiber which is composed of various chains of macromolecular chain connected by ester group and spun into fiber polymer. In China, fibers containing more than 85% polyethylene terephthalate are referred to as polyester for short. There are many international commodity names, such as Dacron of the United States, Tetoron of Japan, Terlenka of the United Kingdom, Lavsan of the former Soviet Union, etc.

As early as 1894, Vorlander made polyesters of low relative molecular weight with succinyl chloride and ethylene glycol. Einkorn synthesised polycarbonate in 1898; Carothers synthetic aliphatic polyester: The polyester synthesized in the early years is mostly aliphatic compound, its relative molecular weight and melting point are low, easy to dissolve in water, so it does not have the value of textile fiber. In 1941, Whinfield and Dickson in Britain synthesized polyethylene terephthalate (PET) from dimethyl terephthalate (DMT) and ethylene glycol (EG), a polymer that could be used to produce fibers with excellent properties by melt spinning. In 1953, the United States first set up a factory to produce PET fiber, so to speak, PET fiber is a kind of late developed fiber among large synthetic fibers.

With the development of organic synthesis, polymer science and industry, a variety of practical PET fibers with different properties have been developed in recent years. Such as polybutylene terephthalate (PBT) fiber and polypropylene-terephthalate (PTT) fiber with high stretch elasticity, full aromatic polyester fiber with ultra-high strength and high modulus, etc. : the so-called "polyester fiber" is usually referred to as polyethylene terephthalate fiber.

Application field

Polyester fiber has a series of excellent properties, such as high breaking strength and elastic modulus, moderate resilience, excellent thermal setting effect, good heat and light resistance. Polyester fibre melting point is 255 ℃ or so, the glass transition

temperature about 70 ℃, in a broad range of end-use conditions stable shape, fabric wash and wear resistance, in addition, also has excellent impedance (such as resistance to organic solvent, soap, detergent, bleach solution, oxidant) as well as good corrosion resistance, the weak acid, alkali, such as stability, thus has wide use and industrial use. The rapid development of petroleum industry, also for polyester fiber production to provide the more abundant and cheap raw material, combined with the chemical, mechanical, electronic control technology in recent years the development of technology, such as the raw material to produce, fiber forming and machining process gradually achieve short-range, continuous, high speed and automation, polyester fiber has become the fastest developing speed, the most productive varieties of synthetic fiber. In 2010, global polyester fiber production reached 37.3 million tons, accounting for 74% of the world's total synthetic fiber production.

Physical properties

1) **Color**. Polyester is generally opalescent with mercerization. To produce matte products, add matte TiO2 before spinning; to produce pure white products, add whitening agent; to produce colored silk, add pigment or dye in spinning melt.

2) **Surface and cross section shape**. The surface of conventional polyester is smooth and the cross section is nearly round. For example, the fiber with special section shape, such as triangular, Y-shaped, hollow and other special-section silk, can be made by using special-shaped spinneret.

3) **Density**. When polyester is completely amorphous, its density is 1.333g/cm3. 1.455g/cm3 when fully crystallized. Generally, polyester has high crystallinity and density of 1.38~1.40g/cm3, which is similar to wool (1.32g/cm3).

4) **Moisture regain rate.** The moisture regain of polyester in standard condition is 0.4%, lower than that of acrylic (1%~2%) and polyamide (4%). Polyester has low hygroscopicity, so its wet strength decreases less, and the fabric is washable; But the static electricity phenomenon is serious when processing and wearing, the fabric breathability and hygroscopicity are poor.

5) **Thermal performance**. The softening point T of polyester is 230-240℃, the melting point Tm is 255-265℃, and the decomposition point T is about 300℃. Polyester can burn in fire, curl and melt into beads, with black smoke and aroma.

6) **Light resistance**. Its light resistance is second only to acrylic fiber. The light resistance of dacron is related to its molecular structure. Dacron only has a strong absorption band in the light wave region of 315nm, so its strength only loses 60% after 600h of sunlight exposure, which is similar to cotton.

7) **Electrical performance**. Polyester has poor conductivity due to its low hygroscopicity, and its dielectric constant in the range of -100~+160℃ is 3.0~3.8, making it an excellent insulator.

Mechanical properties

1) **High intensity.** The dry strength was 4~7cN/ DEX, while the wet strength decreased.

2) **Moderate elongation,** 20%~50%.

3) **High modulus**. Among the large variety of synthetic fibers, the initial modulus of polyester is the highest, which can reach up to 14~17GPa, which makes the polyester fabric stable in size, non-deformation, non-deformation and durable in pleating.

4) **Good resilience**. Its elasticity is close to that of wool, and when extended by 5%, it is almost fully recovered after load shedding. Therefore, the wrinkle resistance of polyester fabric is better than that of other fiber fabrics.

5) **Wear resistance**. Its wear resistance is second only to nylon, and more than other synthetic fiber, wear resistance is almost the same.

Chemical stability

The chemical stability of polyester mainly depends on its molecular chain structure. Polyester has good resistance to other reagents except for its poor alkali resistance.

Acid resistance. Dacron is very stable to acids (especially organic acids) and is immersed in hydrochloric acid solution with a mass fraction of 5% at 100℃.