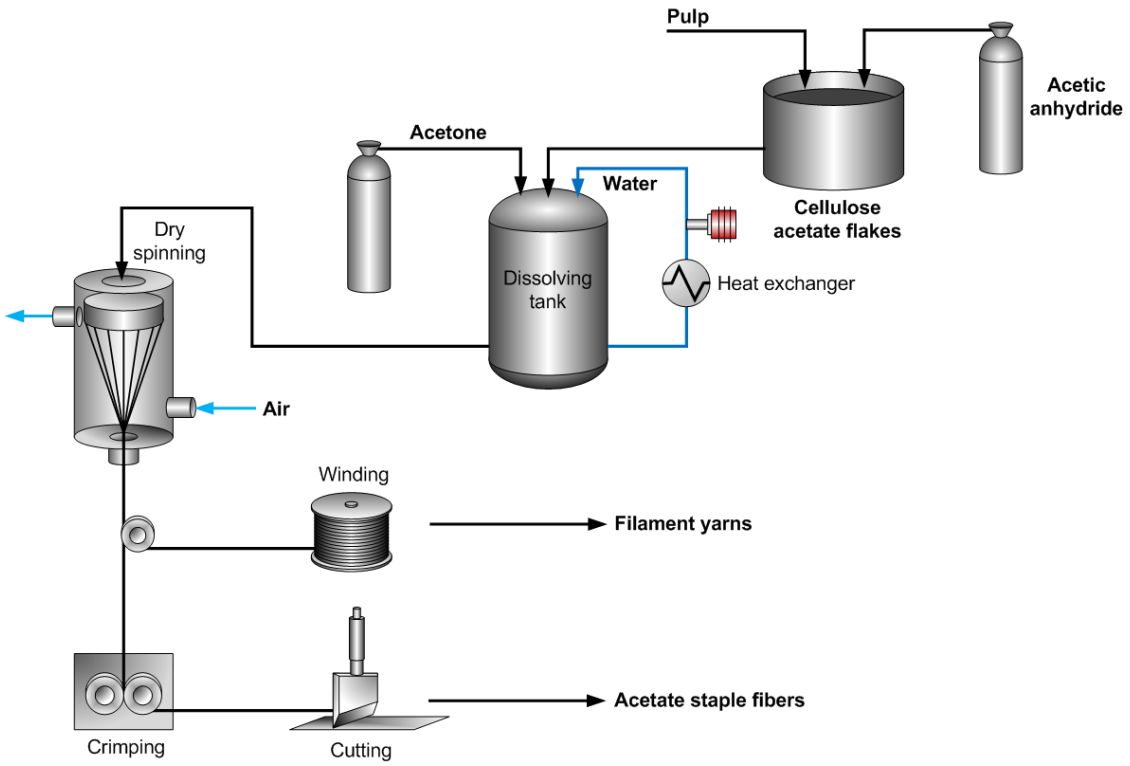
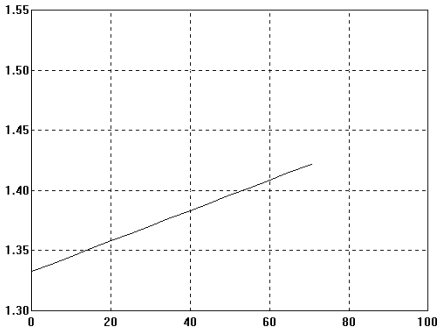


CELLULOSE ACETATE FIBERS, CELLULOCE TRIACETATE (CTA)

Typical end products

Cellulose acetate fibers

Chemical curve: Celluloce acetate dope R.I. per BRIX at Ref. Temp. of 20˚C



Introduction

There are two types of cellulose-based fibers; regenerated/pure cellulose (such as the fibers from the cupro-ammonium process) and modified cellulose (such as the cellulose acetates and rayon).

Acetate fiber is a synthetic fiber, in which the forming substance is cellulose acetate. When no less than 92% of the hydroxyl groups are acetylated, the term triacetate may be used as a generic description for the fiber.

Application

Acetate is derived from cellulose by breaking down wood pulp (dissolving pulp) into purified cellulose. By reacting the purified cellulose with acetic acid and acetic anhydride, whilst using sulfuric acid as a catalyst, cellulose acetate dope is produced. The cellulose acetate flakes are then dissolved into acetone for extrusion. Then, filaments emerge from the spinneret and the solvent is evaporated in warm air.

Production process:

- Purified cellulose from wood pulp or cotton linters.
- Mixed with glacial acetic acid, acetic anhydride and a catalyst (sulfuric acid).
- Put through a controlled 20 hour partial hydrolysis to remove the sulfate and the required amount of acetate molecules to obtain the product's desired properties.

- Precipitated as acid-resin flakes.
- Flakes dissolved in acetone.
- Solution is filtered.
- Spinning solution extruded in a column of warm air. Solvent recovered.
- Filaments are stretched and wound onto beams, cones or bobbins, ready for use.

Fiber Formation Method: Extrusion and Spinning

After being formed, cellulose acetate is dissolved into acetone for extrusion. As the filaments emerge from the spinneret, the solvent is evaporated in warm air (dry spinning) producing fine filaments of cellulose acetate.

The liquid substance of cellulose is forced through a metal cap, or nozzle, called a spinneret. The spinneret is perforated with small holes and a filament is extruded through each one. The extruded filament gets solidified by a liquid bath as it emerges from the spinneret. The number of perforations in a spinneret varies from 1 to 20,000 and filaments of equal gauge are produced simultaneously. Subsequently, filaments are twisted together to form yarn.

As the filaments emerge from the holes in the spinneret, the liquid polymer becomes rubbery and then solidifies. This process of extrusion and solidification of endless filaments is called spinning. It should not be confused with the operation by the same name, used for producing natural yarn, where the shorter lengths of natural fiber are twisted into yarn. There are four methods of spinning synthetic fiber filaments: wet, dry, melt and gel spinning.

Stretching and Orientation

While extruded fibers are solidifying, or in some cases even after they have hardened, the filaments may be drawn to impart strength. Drawing pulls the molecular chains together and orientates them along the fiber axis, creating a considerably stronger yarn.

Installation

The K-Patents Process Refractometer PR-23-GP is used in the dissolving tank for the dope solution prior to the spinning of the fibers. The cellulose is dissolved in a dope solution, which consists of dissolved cellulose in acetone. Only if the Refractive Index of the solution is maintained within a pre-determined limit, a high quality finished product will be achieved. The sensor is installed either in a by-pass loop with an external heat exchanger or directly in the dissolving tank.

The range is typically 20-30% and the process temperature is about 20-60ºC (68-140ºF). Appropriate equipment with hazardous and intrinsic safety approvals are available when required.

Instrumentation	Description
	K-Patents Process Refractometer PR-23-GP is an industrial refractometer for large pipe sizes and tanks, cookers, crystallizers and kettles. Installation through a flange or clamp connection.
Area classification:	Intrinsic safety and hazardous area approvals available.
Measurement range:	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 % by weight.