

DuPont™ Sorona® polymer

TECHNICAL INFORMATION

DuPont™ Sorona® polymer: The only high-performance fiber made with renewable resources.

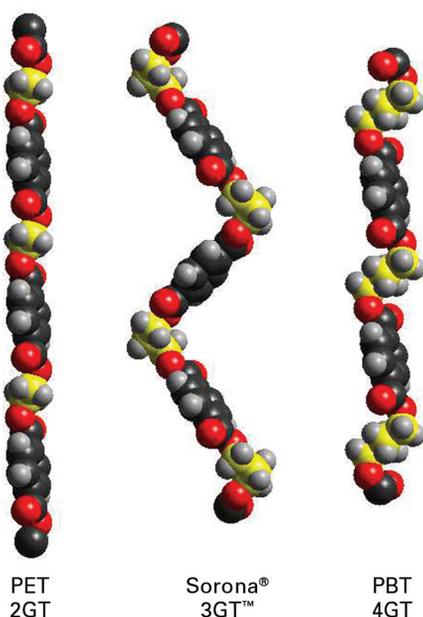


Figure 1. Sorona® 3GT properties derive from its unique molecular structure.

DuPont™ Sorona® polymer provides a unique combination of benefits to a wide variety of applications. This advanced, value-added polymer represents a major new mix-enrichment offering, with the potential for growing into a significant market over the next ten to twenty years.

A unique molecular structure

DuPont™ Sorona® polymer is a unique polymer based on 1,3 propanediol (PDO). Its beneficial properties are derived from a unique, semi-crystalline molecular structure featuring a pronounced “kink,” as shown in Figure 1.

When stress is exerted on the molecule, strain deformation occurs first in its crystalline, lower modulus regions. As stress is released, the crystalline structure locks in, allowing a complete recovery to the initial shape. In conjunction with this distinctive characteristic, fibers made with Sorona® offer additional advantages over both polyester (PET) and nylon: it has a softer feel and supports easier, more versatile dyeability with excellent washfastness and UV resistance.

Sorona® polymer is fiber-grade, which means it has a uniform micro-structure and a high molecular weight that enhances processing. It can be spun into fiber or made into fabric in many existing facilities that now process PET. Because Sorona® polymer is manufactured in a continuous process, the variation of polymer properties is limited. As a result, processing problems and waste generation are minimized, leading to increased productivity.

Key technical features and benefits

1. Softness (a micro-denier feel at greater than one denier)

Both flat and textured yarns may be created from Sorona® polymer, bringing an exceptional new level of softness to any fabric at an easily-workable denier.

The stress-strain tests demonstrate that flat yarns made with Sorona® fibers are softer than either polyester or nylon, at the same denier, because less effort is required to bend Sorona® fibers.

In addition to enhancing the softness of apparel fabrics, Sorona® polymer improves the softness and resilience of nonwovens such as medical garments, monofilaments and brushes.



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2. Stretch with recovery (2-3x greater than nylon)

Both flat and textured yarns made from Sorona® may be made into fabrics with advanced levels of comfort fit.

Research shows that fully drawn flat yarn made with Sorona® recovers 100% from approximately 120% strain. Even at higher strain levels, fibers made with Sorona® recover completely, returning to their initial form.

For textured yarns, fibers made with Sorona® offer up to 145% stretch with 100% recovery. Allowing for the hysteresis effect normally present in textured yarn, fiber made with Sorona® supports a more substantial recovery than other hard yarns do. In addition, Sorona® enables textured yarns to provide greater bulk and cover than nylon, using the same amount of fiber.

3. Easy dyeability at the boiling point with no carriers

Using standard available dyes, fibers made with Sorona® can be dyed at a lower temperature than polyester, without requiring pressure or chemical carriers. The Sorona® polymer molecule enables the crystalline structure of the fiber to begin accepting the dye pigment below the boiling point, at approximately 85° C. Full depth of color is achieved at the boiling point, with outstanding washfastness.

To create patterned fabrics with multiple colors, fibers made with Sorona® can be blended with other fibers prior to dyeing, resulting in differently patterned knit or woven fabrics. In blended fabrics, Sorona® contributes a unique combination of benefits.

4. Resiliency similar to nylon

For use in fabrics such as fleece and velour, fibers made with Sorona® provide a high level of resilience. The crystalline structure of the Sorona® polymer molecule enables the fiber to retain its original memory and bulk, ensuring that the fabric wears exceptionally well.

5. Heatsetability

For easy-care fabrics, fibers made with Sorona® are heatsettable and, if the process is completed correctly, heatsetting does not diminish the stretch with recovery capacity of Sorona®. Most important, fabrics made with Sorona® are heatset at lower temperatures than polyester, providing manufacturers with a new option for blending Sorona® fibers with spandex to create garments with high-power stretch capabilities.

Market availability Industry leadership

Fiber made with Sorona® is available through a global network of licensed fiber producers and mills. A variety of additives, modifiers and lusters are also offered, and specialty differentiated polymers are being developed for unique market opportunities.

DuPont, the industry leader in meeting the requirements of fiber and fabric producers worldwide, has extensive experience working with Sorona® and many other polymers. Its expertise encompasses the entire chain of processes, from raw materials to finished garments. DuPont starts with the basic chemical building blocks of the fiber-grade intermediates that comprise polymers, then continues through the continuous polymerization processing that ensures polymer purity and consistency and finally the innovation is transferred to all down-stream processes involved in creating fibers, fabrics and finished garments. This is a range of competencies unmatched by any polymer resource in the world.

What's Next

DuPont™ Sorona® polymer is made from two monomers or ingredients, one of which is 1,3 propanediol or PDO. DuPont pioneered a way to produce the 1,3 propanediol from renewable resources, namely corn sugar. In 2004, DuPont formed a joint venture with Tate & Lyle, a major corn-based products company with expertise in fermentation processes, to produce Bio-PDO™.

The Bio-PDO™ plant, in Loudon, TN is the world's largest aerobic fermentation plant and is capable of producing 100 million pounds of Bio-PDO™ annually. On a pound for pound basis, production of Bio-PDO™ consumes about 40% less energy than production of its petroleum-based counterpart. The Bio-PDO™ will be used in the manufacturing of Sorona® in early 2007.

The advantages of transitioning to a renewable resource based process for the production of PDO are many and include a smaller environmental footprint, lower manufacturing costs, less energy used, less capital and a more reliable supply of feedstocks.

DuPont continues to innovate to bring quality, high performance products to market in a way that reduces its environmental footprint.

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