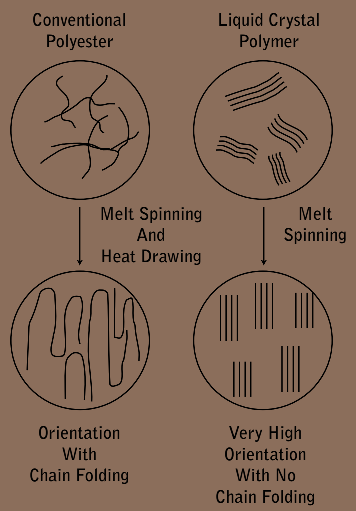
Fiber Chemistry

Vectran™, a liquid crystal polymer (LCP) fiber, offers a balance of properties unmatched by other high performance fibers. This unique fiber's history spans 30 years of research and development in thermotropic (melt-processable) LCP's.

LCP polymer molecules are stiff, rod-like structures organized in ordered domains in the solid and melt states. These oriented domains lead to anisotropic behavior in the melt state, thus the term "liquid crystal polymer." ***Vectran***™ fiber is formed by melt extrusion of the LCP through fine diameter capillaries, during which the molecular domains orient parallel to the fiber axis. The structure's high degree of orientation, illustrated schematically in Figure 1, translates to excellent fiber tensile properties.

Figure 1: Schematic Of Molecular Chain Structure Of Fiber



Molecular Structure

The molecular structure of LCP, a wholly aromatic polyester, is shown in Figure 2.

With conventional polyesters, the molecular chains are random and flexible. Fibers spun from such materials must be further oriented, generally through a combination of extrusion speed and post-spin drawing, to obtain higher tensile properties. Vectran's highly oriented structure is locked in directly during the melt-spinning process, thanks to the molecular structure and liquid crystalline nature of the starting polymer.

Vectran™ is different from other high-performance fibers such as aramid and ultra-high molecular weight polyethylene (HMPE). ***Vectran***™ fiber is thermotropic, it is melt-spun, and it melts at a high temperature. Aramid fiber is lyotropic, it is solvent-spun, and it does not melt at high temperature. HMPE fiber is gel-spun, and it melts at a low temperature.

Figure 2: LCP Molecular Structure