**Spinning** is manufacturing process for creating [polymer](http://en.wikipedia.org/wiki/Polymer) fibers. It is a specialized form of [extrusion](http://en.wikipedia.org/wiki/Extrusion) that uses a [spinneret](http://en.wikipedia.org/wiki/Spinneret_%28polymers%29) to form multiple continuous filaments. There are four types of spinning: wet, dry, melt, and gel spinning.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)

Process

First, the polymer being spun must be converted into a fluid state. If the polymer is a [thermoplastic](http://en.wikipedia.org/wiki/Thermoplastic) then it is just melted, if not then it may be dissolved in a solvent or chemically treated to form soluble or thermoplastic derivatives. The fluid polymer is then forced through the spinneret, where the polymer cools to a rubbery state, and then a solidified state.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)

### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=2)]Wet spinning

Wet spinning is the oldest of the four processes. This process is used for polymers that need to be dissolved in a solvent to be spun. The spinneret is submerged in a chemical bath that causes the fiber to [precipitate](http://en.wikipedia.org/wiki/Precipitate), and then solidify, as it emerges. The process gets its name from this "wet" bath. [Acrylic](http://en.wikipedia.org/wiki/Acrylic_fiber), [rayon](http://en.wikipedia.org/wiki/Rayon), [aramid](http://en.wikipedia.org/wiki/Aramid%22%20%5Co%20%22Aramid), [modacrylic](http://en.wikipedia.org/wiki/Modacrylic%22%20%5Co%20%22Modacrylic), and [spandex](http://en.wikipedia.org/wiki/Spandex) are produced via this process.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)

### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=3)]Dry spinning

Dry spinning is also used for polymers that must be dissolved in solvent. It differs in that the solidification is achieved through evaporation of the solvent. This is usually achieved by a stream of air or inert gas. Because there is no precipitating liquid involved, the fiber does not need to be dried, and the solvent is more easily recovered. [Acetate](http://en.wikipedia.org/wiki/Acetate), [triacetate](http://en.wikipedia.org/wiki/Triacetate), [acrylic](http://en.wikipedia.org/wiki/Acrylic_fiber),[modacrylic](http://en.wikipedia.org/wiki/Modacrylic), [polybenzimidazole fiber](http://en.wikipedia.org/wiki/Polybenzimidazole_fiber), [spandex](http://en.wikipedia.org/wiki/Spandex), and [vinyon](http://en.wikipedia.org/wiki/Vinyon%22%20%5Co%20%22Vinyon) are produced via this process.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)

### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=4)]Melt spinning

Melt spinning is used for polymers that can be melted. The polymer solidifies by cooling after being extruded from the spinneret. [Nylon](http://en.wikipedia.org/wiki/Nylon), [olefin](http://en.wikipedia.org/wiki/Olefin), [polyester](http://en.wikipedia.org/wiki/Polyester), [saran](http://en.wikipedia.org/wiki/Saran_%28plastic%29), and [sulfar](http://en.wikipedia.org/wiki/Sulfar%22%20%5Co%20%22Sulfar) are produced via this process.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)

#### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=5)]Extrusion spinning

Pellets or granules of the solid polymer are fed into an [extruder](http://en.wikipedia.org/wiki/Extruder). The pellets are compressed, heated and melted by an extrusion screw, then fed to a spinning pump and into the spinneret.

#### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=6)]Direct spinning

The direct spinning process avoids the stage of solid polymer pellets. The polymer melt is produced from the raw materials, and then from the polymer finisher directly pumped to the spinning mill. Direct spinning is mainly applied during production of polyester fibers and filaments and is dedicated to high production capacity (>100 ton/day).

### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=7)]Gel spinning

Gel spinning, also known as dry-wet spinning, is used to obtain high strength or other special properties in the fibers. The polymer is in a "gel" state, only partially liquid, which keeps the polymer chains somewhat bound together. These bonds produce strong inter-chain forces in the fiber, which increase its tensile strength. The polymer chains within the fibers also have a large degree of orientation, which increases strength. The fibers are first air dried, then cooled further in a liquid bath. Some high strength [polyethylene](http://en.wikipedia.org/wiki/Polyethylene) and aramid fibers are produced via this process.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)

### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=8)]Electro spinning

Electro spinning uses an electrical charge to draw very fine (typically on the micro or nano scale) [fibres](http://en.wikipedia.org/wiki/Fibre) from a liquid. Electrospinning shares characteristics of both [electrospraying](http://en.wikipedia.org/wiki/Electrospray%22%20%5Co%20%22Electrospray) and conventional solution dry spinning[[2]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29%22%20%5Cl%20%22cite_note-ziabicki-1) of fibers. The process does not require the use of coagulation chemistry or high temperatures to produce solid threads from solution. This makes the process particularly suited to the production of fibers using large and complex molecules. Electrospinning from molten precursors is also practiced; this method ensures that no solvent can be carried over into the final product

*see also the main article on [Electrospinning](http://en.wikipedia.org/wiki/Electrospinning%22%20%5Co%20%22Electrospinning)*

### [[edit](http://en.wikipedia.org/w/index.php?title=Spinning_(polymers)&action=edit&section=9)]Drawing

*Main article:*[*Drawing (manufacturing)*](http://en.wikipedia.org/wiki/Drawing_%28manufacturing%29)

Finally, the fibers are drawn to increase strength and orientation. This may be done while the polymer is still solidifying or after it has completely cooled.[[1]](http://en.wikipedia.org/wiki/Spinning_%28polymers%29#cite_note-fs-0)