Electrospinning process is not a new technology. It was patented by John F. Cooley in 1902 (US Patent #692,631) but did not find much application at that time. With the development of polymer nanomaterials in the early 1990s, it has re-emerged as a useful technique because of its straightforward setup and execution.

Electrospinning produces polymer nanofibers, fibers with diameters in the range from nanometers to a few microns. High voltage is applied to a polymer solution stored in a syringe. A grounded electrode – a metal plate – is placed 5–20 cm away from the syringe needle. The polymer solution flows from the needle tip and is stretched into a Taylor cone due to the high electric field between the electrodes. The entangled polymer chains in the solution form a single liquid jet. Electrostatic forces within the jet cause bending instabilities that whip the jet from side to side. Concomitant evaporation of solvent allow this jet to be stretched resulting in the fabrication of uniform fibers with nanometer-scale diameters, and the lengths from centimeter to meter scale. Nanofibers are hard to be produced without the bending instability stage in electrospinning process.

In general, most polymers can be electrospun provided a suitable solvent is chosen for preparing the polymer solution. The more sensitive parameters determining the quality of the final product are strength of electric field, solution feed rate and polymer solution/viscosity, surface tension and dielectric constant, with needle diameter having less influence. Some polymers like polyethylene, poly(methyl methacrylate) can be electrospun via a melt electrospinning process but this typically generates thicker fibers. Electrospinning is not limited to the polymer field and has been extended into sol-gel systems to fabricate oxide nanofibers of silica and titania. Even some metal precursors have been added to polymer solutions to yield metal nanofibers of iron, copper, cobalt and nickel.

Nanofibers possess large surface area to unit mass ratio. Thus, non-woven fabrics of these nanofibers can be used, for example, in the filtration of submicron particles in separation industries and in biomedical applications, such as wound dressing in medical industry, tissue engineering scaffolds and artificial blood vessels. Electrospun fibers have potential as enzyme attachment surfaces and as carriers for catalytic nanoparticles.