

# **ELECTROSPINNING OF NANOFIBERS**

**A.L.Yarin**

**Department of Mechanical Engineering,**

**Technion-Israel Institute of Technology,**

**Haifa 32000,Israel**

**e-mail:meralya@yarin.technion.ac.il**

A straightforward, cheap and unique method to produce novel fibers with diameter in the range of 100 nm and even less, is related to electrospinning. For this goal polymer solutions, liquid crystals, suspensions of solid particles and emulsions are electrospun by a voltage of about 1 kV/cm. The basic physics of the process is discussed first. This includes the electric forces resulting in an electrically charged jet of polymer solution outflowing from a droplet tip; bending fractal-like instability of the jet, and its evaporation and solidification in parallel with an enormous stretching by the electric forces. Theoretical aspects of all the stages of the process are considered and compared to the experiments. An additional phenomenon mentioned is garland formation. Then modifications and applications of the electrospinning process are considered. These are: self-assembly used to make ordered nanofiber arrays, nanoropes and crossbars; nanofibers reinforced by carbon nanotubes; and coelectrospinning of compound and hollow nanofibers and nanotubes. Multiple-jet processes intended to increase production rate are discussed as well, which includes interaction of neighboring jets and needleless electrospinning employing magnetic liquid layer.