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Mechanism of breakup of electrospun jet at the nozzle KOSTYA KORNEV, VLADISLAV VEKSELMAN, GILLES MOHL, Clemson University, DEPARTMENT OF MATERIALS SCIENCE & ENGINEERING TEAM — In the electrostatic formation of nanofibers, a high voltage is applied to a polymer solution to withdraw it through the nozzle as a jet. We report on an interesting instability leading to the jet breakup right at the supporting meniscus making the generation of sequential jets sporadic and inconsistent. The conventional electrospinning setup was modified to provide visualization of the meniscus inside the nozzle. A glass capillary was used as a nozzle. A wire connecting a high-voltage power supply was inserted into a tube and secured inside the glass capillary. The end of the wire was positioned far away from the free end of the glass capillary where meniscus was formed. In this method, the body of polymer solution was held at the same potential. Using fluorescence microscopy it was observed that meniscus is very sensitive to the applied voltage and is able to move inside the nozzle as the voltage increases. As meniscus moves inside the nozzle, it forms a liquid film leaning to the inner wall of the nozzle. This film connects meniscus and the jet. The jet breakup is caused by the thinning and rapturing of this film. A simple scaling model showing interplay between the capillary pressure and Maxwell stress is proposed and used to explain the jet instability.

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