

ELECTROSPINNING OF POLYMER LIQUIDS

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Electrospinning is an effective process of submicron fibers formation which based on application of voltage to polymer solutions or melts. As rule polymer liquids have free charges, for example owing to additives or polyelectrolyte nature of the chains and, therefore, can deform in electric field and form jet. Despite of increasing interest to electrospinning which has rather long history the adequate theoretical description of the process still does not exist. In this connection a system of electro-hydrodynamic equations describing dynamics of polymer jet is proposed. This system include rheological and momentum balance equations of polymer liquid, Laplace equation for potential inside and outside the jet, charge balance equation and force balance equation at the jet surface. Analysis of these equations allows qualitatively predict behavior of the polymer fluid and estimate such characteristics as the flow rate, the electric current and the fiber diameter.