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The effect of electric field on the stability and breakup of liquid nano-thread. DARSHAK BHUPTANI, SARITH SATHIAN, Indian Inst of Tech-Madras — The stability behavior of nano-scale stationary polar liquid (water) thread in vacuum and in environment under the action of an external constant electric filed is investigated using molecular dynamics (MD) simulations. The Rayleigh instability predicts the non-dimensional wave number for nano-thread to be in the range of 0.2 to 0.5 whereas for a macroscale it is around 0.697. The classical viscid theory predict the first breakup time of nanoscale liquid thread accurately. At nanoscale, thermal fluctuation and surface tension forces plays a critical role in the breakup mechanism. The main objective is to investigate the effect of an additional external force in the form of an electric field on the stability and breakup. The effect of surface tension and the role of thermal fluctuation on the breakup in such cases are investigated. A uniform electric field is applied along the axial direction of thread. For lower values of field strength (0.1V/nm), no breakup is observed as the surface tension force is completely balanced by the electrical force experienced by the surface molecules. With increase in the electrical field strength, different phenomenon such as Taylor's cone formation, molecule orientation, whipping instability and splaying are observed.

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