

Dynamics of a dust layer suspending in a plasma and interacting through a Yukawa-type potential is considered. In the small affinity limit, the influence of an external white noise on the formation of Tsallis' velocity distribution function is studied through molecular dynamics simulation. The characteristic length of the noise is much smaller than the system size that causes a number of subsystems (islands) to be formed with the size similar to the noise one. The external noise leads to the temperature fluctuation in each island. Therefore, a stochastic formalism based on a Langevin equation for the fluctuating temperature is presented. The approach provides a dynamical reason how a fluctuating temperature takes a system to a unique class of quasi-equilibrium states. In particular, the dependence of the model systems on the noise parameters is explained. The non-extensive parameter is obtained through which the small affinity limit can be defined.