

Thematic area of your work (nanoscale physics)

Classical 1D structures of charges in Coulomb cluster systems

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It is shown that high-ordered 1D-structures of particles with a single sign of charge can be simulated on a limited length scale in the jellium model of a cluster system. In this work confining potential of a cluster is originated from the uniform cylindrical background and is specified by length $2L$, diameter $2R$ and by whole charge eN_b of a background. 1D-structure consists of N charge units $-e$ aligned with cluster axis in equilibrium state (inset in Fig.1)). The ordering of 1D-structure is defined by the dispersion δx in the distribution of inter-particle intervals of a chain with respect to corresponding mean inter-particle spacing d .

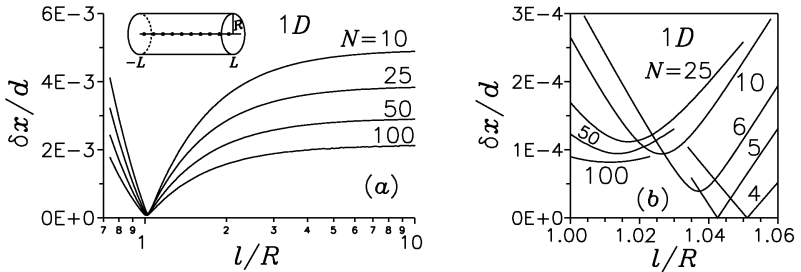


Fig.1. Ordering $\delta x/d$ of 1D-structures in neutral clusters ($N=N_b$) vs geometric factor l/R ($2l=2L/N_b$ is the length of unit cell of background per unit charge e) in (a) a wide range of l/R and (b) in a small range covering bottom side of $\delta x/d$.

Behavior of relative dispersions $\delta x/d$ in 1D-phase is shown in Fig.1. Values of dispersions $\delta x/d$ are of less than 1% by an order of magnitude throughout the phase. Generally quite high ordering of 1D-structures comes about within a cluster model used. Dispersions exhibit particular behavior on the right from the argument value $l/R=1$ when take minimal values of $\leq 0.01\%$ and exact zero's in the case of

$N=4$ and $N=5$. Physical mechanism responsible for this peculiarity is discussed.