Multiple Exclusion statistics: from single species to mixtures

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Previously in a work of ours [1] we present a new distribution for systems of particles obeying statistical exclusion of correlated states is presented following Haldane's [1] state counting. It relies upon a conjecture to deal with the multiple exclusion that takes place when the states available to single particles are spatially correlated and it can be simultaneously excluded by more than one particle. Here we generalized our previous work to the case of having particles of multiple species also obeying to statistical exclusion of correlated states, Multiple Exclusion Statistics (ME). The ultimate aime of here is to develop a thermodynamic framework to the general problem of particles with arbitrary size/shape on a lattice assuming hard-core interactions, focusing on the mixture of species case. Our interest in generalizing Multiple Exclusion statistics to the case of multiple species is due to the intent of explaining nematic transition [2] of k-$mers$ on a square lattice rationalized as a mixture of two species, each one along a characteristic orientation on the lattice. It is explored the ability to displey the nematic transition for $k = 7$ at low density and the nematic-disordered phase at high density. Full forms of the free energy, entropy and chemical pontential are presented as functions of the density ok k-$mers$ in each characteristc direction on the lattice as well as the phase coexistence lines arising from this description proposed here ; and the state-exclusion spectrum functions shedding light on the behavior of the systems at and along the isotropic-anisotropic nematic phase transition studied here.

Referencias:

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