The statistics of clusters in the system of intersecting spheres randomly distributed in space

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The new type of distribution function of particles over the clusters have recently been introduced in Ref. [1]. The distribution belongs to a system of identical intersecting spheres with radii R, the centers of which are uniformly distributed in space. Consideration is based on the concept of the rank number of clusters, where the rank is assigned to clusters according to the cluster sizes. The distribution function has some standard form, which does not depend on boundary conditions and is valid for infinite medium. The shape of the distribution function depends only on one parameter. It is the ratio $a = R/l_0$, where $l_0 = 0.554n^{-1/3}$ is the mean distance between "particles" (i.e. centers of spheres), which are assumed to be randomly distributed over the whole volume V, and the particle density, $n = N_0/V$, N_0 is the number of "particles" in the system. We study the properties of the standard distribution in detail and its applications to some realistic physical situations, which are close to the conditions of the gas condensation to liquid.

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