ANALYTICAL SOLUTION FOR SPHERICALLY SYMMETRIC BIPARTITE DISTRIBUTIONS

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It is shown that for spherically symmetric distributions dvudolnyh all multipole moments except dipole, zero. So Maxwell-Garnett result, or the proportion of Clausius-Mossotti for spherical particles is true regardless of the concentration of particles.

The use of an analytical approach to the study of boundary polarization heterogeneous systems was considered in [1,3]. In the case of spherical particles was derived formulas of all multipole moments of the electric field and the effective dielectric constant, which is valid for any default distribution. For nonspherical distribution of our dielectric constant different from the Maxwell-Garnett result: in this case the difference is of the order of fate volume that takes a piece and can be quite significant. These results were obtained in [2].

The purpose of research is to analyze the important special case of the use of an analytical approach to the study of the dielectric system of spherical particles, in which the function $f\ \ r - r_i$ is completely spherically symmetric.

Materials and methods research. If the function $f\ \ r - r_i$ is completely spherically symmetric, then $f_l^{l'} = 0$ because of the orthogonality of spherical harmonics. This means that other particles from the zone correlations do not give any contribution to the local field acting on this particle. Accordingly, the local field is uniform, no matter what it may be radial dependence of $f\ \ r - r_i$. This is true for particles of arbitrary shapes and orientations.

We proved that for any bipartite division of SSC spherically symmetric correlation nonzero dipole moments only.

Results. Within the mean field corrections to the Maxwell-Garnett formula can only arise from nesferychnosti distribution in which the multipole moments of neighboring particles give a contribution to the local field of the particle. These amendments appear before all of the coefficients $f_l^{l'}$, rather than from the high concentration of particles. Therefore, any theory within a mean field that involves modifying Maxwell-Garnett formula based on the average concentration of particles rather than the specifics of bipartite distribution is incompatible with our result.

Conclusions

The important special case of spherically symmetric bipartite distribution. In this case, particles that are outside the range of the considered particle correlations, make no contribution to the local field acting on this particle. Therefore, each particle exposed to a uniform local field no matter what in this case is the radial dependence distribution and particle shape and orientation. If the particles are spherical, the aforesaid uniform local field can induce a dipole moments only, while higher multipole moments disappear. So Maxwell-Garnett result or, respectively, the ratio Clausius-Massotti for spherical particles, the result is a clear and unlimited as applied to dilute or application of the dipole approximation. So accordingly modified Maxwell-Garnett outcome within a mean field, taking into account only the concentration of particles and disregard specific form of bipartite distribution different from our results.