Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Stochastic Functional Expansion for Identifying the Effective Heat Conductivity Coefficient of Polydisperse Suspension[1] ABHINANDAN CHOWDHURY, Savannah State University — We consider a random two-phase medium which represents a matrix containing an array of non-overlapping spherical inclusions with random radii. A statistical theory of transport phenomena in the medium is constructed by means of the functional (Volterra-Wiener) series approach for identifying the effective heat conductivity of a polydisperse spherical suspension. An approximate model based on power-series expansion of the kernels with respect to the volume fraction is developed. The functional series for the temperature is rendered virial in the sense that its truncation after the p-tuple term asymptotically correct to the order γ^p where γ is the mean number of spheres per unit volume – also proportional to the volume fraction. The case $p = 2$ is considered in detail and the needed kernels of the functional series are found to the order γ^2. The truncated Volterra-Wiener expansion is applied consistently to derive the equations for the kernels and their contributions to the overall (effective) modulus are identified. In this way, not only the effective conductivity, but also all needed correlation functions can be expressed in closed form, correct to the said order.

[1]NSF Catalyst Project Grant 1800798

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Date submitted: 10 Aug 2020 Electronic form version 1.4