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Effective Properties of Solids Containing Randomly Distributed Multi-Phase Spherical Particles

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In this paper, the micromechanical method of homogenization is used to estimate the overall mechanical behaviour of solids containing high concentration of heterogeneous spherical particles. The previous treatments in the literature have failed to account for the long and short range interactions of thickly coated particles rigorously. Recently, based on the extension of Eshelby's equivalent inclusion method (EIM) to multi-inhomogeneities, the overall behaviour of solids with periodic distribution of multi-phase interacting particles has been estimated by the authors, which involved the Fourier series expansions of the eigenstrains. In this work, an accurate formulation suitable for composites containing non-dilute distribution of thickly coated particles with random microstructure is presented. The theory incorporates the complex interaction of many interacting multi-inhomogeneities, a scenario encountered when dealing with non-dilute concentration of multiple coated fiber reinforced composites.

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