Asymptotic homogenization approach applied to periodic laminated Cosserat media with imperfect contact conditions

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In this work, the two-scale asymptotic homogenization method (AHM) is applied to find the effective properties of periodic laminated Cosserat media with centro-symmetric constituents and non-uniform imperfect interface contact conditions, i.e., tractions and coupled stress are continuous but displacements and microrotations are discontinuous across the imperfect interface. The jumps in the displacement and microrotation components are proportional to their respective interface traction and coupled stress components in terms of a partition of different spring-factor-type interface parameters. Series expansions are proposed as a function of a local (microscopic) variable and a global (macroscopic) variable for the displacement and microrotation fields. The local problems are solved; the effective properties are given as a function of the material properties of the constituents, the volume fractions of the phases and the imperfection parameters. Numerical results are reported and discussed for a bi-laminated Cosserat composite assuming multiple interface imperfection partitions and different ranges for the imperfection parameter values. The effect of imperfections on the effective properties is illustrated.