HOMOGENIZATION BASED COMPOSITE MATERIALS PROPERTIES ESTIMATION: AN APPROACH FOR DESIGN AND OPTIMIZATION

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Homogenization techniques have been receiving wide attention for decades in the academic community. Mathematically, an equivalent homogeneous medium is sought to describe the behavior of heterogeneous materials. For most of the cases, composite materials are described as homogeneous at the macroscopic level and heterogeneous at the microscopic level. Then, homogenization techniques offer a unique tool to connect microheterogeneities with macrohomogeneity to better understand the structure-properties relationship and make more efficient optimization and designs. Hence, the connection between homogenization and composite materials overall properties is analyzed. In the present work, we apply the asymptotic homogenization method (AHM) to estimate the effective properties of composite materials. A proposal to maximize the magnetoelectric coupling is reported. The effect of fiber spatial distribution on the final properties is also presented. A hybrid between AHM and Finite Element Method known as SAFEM is also presented to analyze polycrystalline materials that can be studied as composites ones.

Keywords: Homogenization, Effective properties, composite materials

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