VALIDATION OF A COMPUTATIONAL MODEL BASED ON A HYBRID APPROACH BETWEEN THE ASYMPTOTIC HOMOGENIZATION AND FINITE ELEMENT METHODS FOR MAGNETO- ELECTRO- ELASTIC MICROMECHANICAL CHARACTERIZATION

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A hybrid approach between the asymptotic homogenization (AHM) and finite element (FEM) methods has been developed with the objective of studying a wide range of types of composites materials. The AHM is based on developing an asymptotic expansion on two scales. Conveniently, one scale is used for describing the microstructure and the other one is related to the macroscopic level where effective properties are of interest. The above mentioned expansion is substituted into the heterogeneous governing equations and a set of local o canonical problems arise. For long cylindrical problems, it is possible to find analytical solutions for the local problems and effective properties can be obtained. However, there are other types of composites where an analytical solution is not possible to find. For example, a short fiber reinforced composite or those with irregular shape inclusion. For these cases, local problems are solved by means of implementation of the finite element method (FEM). An important step for the model validation is to check its capability to reproduce the results obtained with analytical approximations. An epoxy matrix with Barium Titanate (BTA) or Cobalt Ferrite (CFO) fibers are herein studied. A magneto- electric fiber is also considered and it is made of a combination of BTA and CFO.

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