VII International Conference on Computational Methods for Coupled Problems in Science and Engineering – Coupled Problems 2017

The influence of thermal barriers in anisotropic media applied to PCB using MEC

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ABSTRACT

Many electronical components were developed during the last years and many efforts were devoted to the miniaturization of their components due to the global tendency. The matrix in which the components are mounted are made of composite materials which presented anisotropic behaviour. The main goal of this work relies on determining the influence of the thermal barriers position inside of a PCB. The plate has 168 thermal barriers inside the domain where each one has a 360° of freedom of rotation. A Dirichlet boundary condition was imposed to all corners of the plate. At the upper right corner D a temperature of 100°C was prescribed, while for the remaining ones a temperature of 25°C was imposed. The heat flux was observed at the A, B and C corners, as the internal barriers were rotated. A quadratic boundary element was used with 6 points of Gauss. The multipoint Genetic Algorithm was employed in order to maximize the objective function at the corner A and minimizing at the corners B and C. The angles of rotation for the thermal barriers are the design variables during the optimization process. The figure 1 depicts the heat flux evolution, due to the barriers rotation, at the corners A, B and C for isotropic and anisotropic domain.

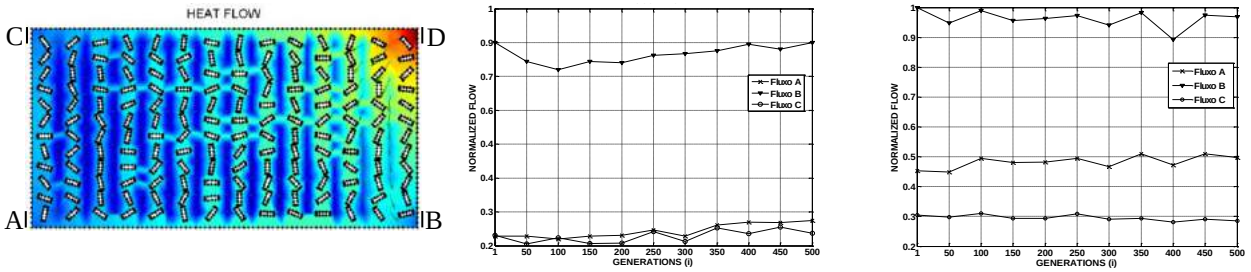

Figure 1 – (a) Boundary Conditions **b) Isotropic optimized flow** **c) Anisotropic optimized flow**

Despite the elevated number of variables classified this problem such as non-convex, the final results showed good convergence. The stop criterion was achieved when a 500 generations was reached. Perhaps the optimization process should be extended for a higher number of iterations in order to turn the final solution more evident. The isotropic plate presented an increase of heat flux at the corner A much more evident than for that one calculated at the same corner for the anisotropic case. A suitable explanation relies on the fact that the anisotropic behaviour is strongly influenced for the rotation of the internal fibers and much more evident when the matrix is also anisotropic.

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