however, it seems not to be necessary with respect to satisfactory precision of calculations for a number of Gauss points equal to 2.

Conclusion remark

In the paper, a simple way of average thermal conductivity calculation of FGM filled with long parallelly-arranged fibres was presented. Next the effective thermal conductivity for a layer of fibre FGM was determined in the gradient direction of fibre diameter changes. Numerical calculations were carried out for a material of linear variability of fibre diameter, assuming different velocity of fibre radius changes across the thickness of the material sample.

Additionally it was shown that in the case of thermal properties, lamina consisting of three or more layers can be treated as continuous with good accuracy. Consequently there is no need to consider all layers of lamina because we can homogenise them in one structure with the prescribed function defining the variability of the fibre diameter, and then treat it as continuous.

The effectiveness of the proposed method of calculation of effective thermal conductivities of fibre FGM is defined by the number of elementary mathematical operations which have to be done to calculate proper integrals. Assuming numerical integration using five Gauss points to calculate the average thermal conductivity at a given point and two Gauss points to calculate the effective thermal coefficient of the whole layer of fibre FGM, we need a little more then one hundred elementary mathematical operations. In the real world of numerical calculations, the time of execution of this number of calculations is negligibly small.

To verify the accuracy of this approach we need practical tests. In the case of insufficient compatibility of practical test results with numerical calculations, the method proposed should be revised taking into account the stochastic approach to fibre arrangements in the unit cell.

References


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