



Analysis of damping characteristics of Aluminium metal matrix-carbon particulate composite with uniform and graded dispersion using 3D-FEM and FDM

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Abstract

This paper describes the study of dynamic characteristics of carbon particulate Aluminium composite subjected to dynamic loading. A numerical study for obtaining the natural frequencies and amplitude of vibrations are conducted. The damping behaviour of composite is analysed for cyclic loading using FEM and FDM. This study also covers the variation of the characteristics with different volume fractions under different loading situations. The response of an LM6 alloy-Carbon metal matrix particulate composite is employed for the study.

Key words: 3D FEA, FDM, Aluminium MMC, Damping, Response, Concentration gradient

1. Introduction

Particulate composites are non-homogenous and anisotropic in nature and have a random dispersion of particles of different nature throughout an isotropic matrix. The classical rule of mixtures is used to estimate the properties of such a system. Though popular, it considers uniformity, homogeneity and isotropy that are non-existent in a composite. This can be clearer in case of graded composites, where rule of mixtures considers only the volume fractions irrespective of the particle location or concentration. Moreover, the behaviour of a composite cannot be defined by a rule of mixtures. Hence a new

methodology is proposed.

In recent times composites have emerged as a preferred material in various engineering applications due to the wide variety of customizable mechanical properties they offer. Composites are replacing many of the conventional materials in structural applications. There is a tough utility competitiveness between Metal matrix composites (MMC) and Polymer matrix composites (PMC), but MMC are superseding PMC in applications due to their higher strength and high-temperature stability (www.epfl.ch/people/cayron/fischi). The properties of composites depend on the characteristics of the matrix, reinforced fibre and the inter-phase. In the last few years, Aluminium matrix Composites (AMC) have been utilized