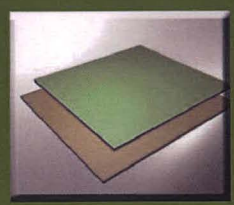
ADVANCES IN COMPOSITE MATERIALS



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Chapter 001

A Critical Review of Metal Matrix Composite Brake Rotor

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Keywords: Historical background, metal matrix composite, brake rotor, product life cycle.

Abstract. In this chapter, a historical background on the development and application of metal matrix composite for automotive brake rotor is presented. The discussion also includes analysis of the product life cycle for stir casting. The historical review analysis revealed that gradual development of material and processing technique have led to a lighter weight, lower cost, and higher performance brake rotor as a result of the better understanding of the mechanics of metal matrix composite. This can be used as a tool for future design and manufacture of an efficient and effective aluminium matrix composite brake rotor for automotive and other applications.

Introduction

During the past 40 years, materials design has shifted emphasis on pursuing light weight, environment friendly, low cost, quality, and better performance materials. Parallel to this trend, metal-matrix composites (MMCs) have been attracting growing interest for many applications [1-4]. MMCs attributes include alterations in mechanical behaviour (e.g., tensile and compressive properties, creep, notch resistance, and tribology) and physical properties (e.g., intermediate density, thermal expansion, and thermal diffusivity) by the filler phase; the materials' limitations are thermal fatigue, thermo-chemical compatibility, and low-transverse creep resistance. New research activities have been directed towards developing an improved understanding of their potential and limitations invoking principles of physical metallurgy, stress analysis, processing sciences and applications.

In recent years, metal matrix composites (MMCs) have become attractive for engineering structural applications due to their excellent specific strength property and are increasingly seen as alternative to the conventional materials particularly in the automotive industry. Metal-matrix composites (MMCs) have been used commercially in the automotive market for nearly 20 years. Properties of interest to the automotive industry include increased specific strength and stiffness, wear resistance, thermal conductivity and improved high-cycle fatigue resistance [5]. Weight savings is also important in automotive applications with the need for achieving performance improvements with much lower-cost materials and processes. There has been successful application in several automotive applications in which the combination of properties and cost satisfied a particular need. As a result of these successful applications, business communications company (BCC), estimates that the global market for metal matrix