A NEW WEAR RESISTANT COMPOSITE MATERIAL

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ABSTRACT

A composite material consisting of WC-Co particles in a steel matrix was fabricated by sintering mixtures of WC-Co particles and a steel powder and infiltrating the sintered pieces with a copper alloy. Its wear resistance and mechanical properties were studied as a function of the content in WC-Co particles and other characteristics of the composite material microstructure.

Infiltration provided a simple means to obtain a strong cohesion between WC-Co particles and the steel matrix. An effective matrix protection against wear is obtained with relatively low additions of particles especially with a silica abrasive which is soft with respect to cemented carbide. The experimental results show that this material has good mechanical properties and wear resistance. Depending upon abrasion resistance, wear losses are reduced up to 10 times by a 30 vol % addition of cemented carbide particles.

INTRODUCTION

Wear resistance of materials normally increases with their hardness but it is also strongly affected by their microstructural characteristics[1-3]. For example, it is reported that the best abrasion resistance of steels is found when they contain a hard second phase like carbides distributed in the matrix[4]. However, the abrasive wear of steels containing a large proportion of carbides depends strongly on the cohesion of these carbides with the matrix as well as on the size, shape and brittleness of the carbides[5]. The highest abrasion resistances are generally found in alloys having hard second phases coherently bonded to the matrix and not distributed as a continuous network in it.

The objective of this work was to develop an abrasion resistant steel base material containing a hard discontinuous cemented carbide phase tougher than pure carbide and strongly bonded to the steel matrix. The method