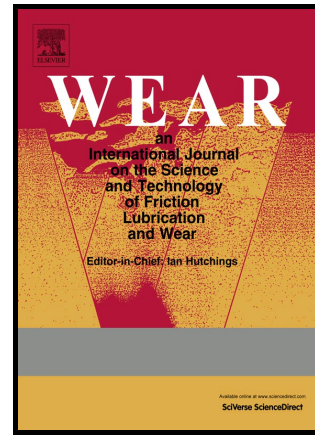


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Abstract

Metal injection moulding (MIM) was used to process steel matrix composites reinforced with different amounts of vanadium carbide (VC) for tooling applications. The effects of adding VC on dry sliding wear behaviour have been investigated in detail using pin-on-disk and ball-on-flat tests. Final properties have been correlated with the microstructural analysis and XRD patterns. Increasing the amount of added VC has an inhibiting effect on the growth of the grains and larger amounts of particles are precipitated. These facts show that the microhardness and wear properties improve with higher amounts of additive. Thus, there is a tendency towards a better wear resistance with higher carbide additions. Additionally, better wear results have been obtained than those by conventional Powder Metallurgy (PM) using the same materials.

Keywords:

Powder injection moulding, Steel matrix composite, Wear testing, Dry sliding wear.

1. Introduction

Conventional high-speed steels (HSSs) contain, among other alloying elements, tungsten, molybdenum, chromium and vanadium in a range of about 10–25% [1]. This composition provides the material special properties, such as high toughness and high hot hardness, which makes HSSs outstanding tool, cutting and wear resistant materials [1, 2] due to the formation of carbides, nitrides and/or nitrocarbides. These properties allow much higher speeds and rate of cutting when machining because they retain their hardness at higher temperatures.

Production of the conventional HSSs involves melting, casting, hot working and heat treatment, as it does for other steels. During solidification, the M_6C -type carbide often grows into fishbone-like structures, and M_2C -type carbide often grows into a needle-like structure [3, 4]. These two types of carbides have microstructural characteristics of as-cast HSSs. So, HSSs fabricated by conventional cast processes contain a comparably high proportion of coarse, heterogeneously distributed, and large bulk carbides. These

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