Archives of Materials Science and Engineering

Volume 28
Issue 10
October 2007
Pages 617-620

International Scientific Journal
published monthly as the organ of
the Committee of Materials Science
of the Polish Academy of Sciences

Influence of carbide (W, Ti)C on the structure and properties of tool gradient materials

L.A. Dobrzański*, B. Dołżańska, G. Matula
Division of Materials Processing Technology, Management and Computer Techniques in Materials Science, Institute of Engineering Materials and Biomaterials, Silesian University of Technology, ul. Konarskiego 18a, 44-100 Gliwice, Poland
* Corresponding author: E-mail address: leszek.dobrzanski@polsl.pl

Received 07.07.2007; published in revised form 01.10.2007

ABSTRACT

Purpose: The goal of this work is to obtain the gradient materials based on the (W, Ti)C with high disproportion of cobalt matrix portion between core and surface layer. In this work is shown the structure and properties of Tool Gradient Materials (TGM).

Design/methodology/approach: In presented study (W, Ti)C powder were mixed with cobalt powder. Prepared mixtures were heaped up, pressed at 300MPa and sintered in vacuum furnace at temperatures 1450°C. Produced gradient materials were studied by scanning electron microscope (SEM), light microscope. Hardness tests and density examination were also made.

Findings: According to carried out researches it could be stated, that forming the gradient materials with highest portion of complex carbide (W,Ti)C 91-95%, using uniaxial unilateral pressing, could be possible after adding into each layer of mixtures 2 % of paraffin lubricant. High diversification of cobalt matrix ratio in comparison with hard phases in subsequent layers of gradient materials leads to their deformation in as sintered state. In case of all gradient materials, mean hardness was equal about 1600 HV1. Whereas, hardness of lower cobalt matrix rich layers has value about 1450 HV1 which increases up to 1700 HV1 for lower layer of material rich with hard carbide phases.

Practical implications: The Powder Metallurgy gives the possibility of manufacturing tools gradient materials characterised by very high hardness on the surface and relative ductility in core.

Originality/value: In the work the manufacturing of TGM on the basis of different portion of cobalt matrix reinforced with hard ceramics particles carried out in order to improve the abrasion resistance and ductility of tool cutting materials.

Keywords: Cemented carbides; Tool gradient materials; Powder metallurgy

PROPERTIES

1. Introduction

Powder metallurgy is the most important method by which Tool Gradient Materials (TGM) are produced, belonging to one of the main groups of manufacturing technologies of such materials and metal matrix composites. The powder metallurgy is implemented in solid state, minimizing the possibility of creating the brittle interfacial boundaries[2-8].

Tool Gradient Materials are composites consisting of two different materials with a gradient composition. These materials obtained with powder metallurgy processes are characterised with properties witch are impossible to achieve with other methods [1,7-11].

This group of sintered materials has outstanding properties of high values of hardness and wear resistance. Such material, no doubt, has found increased technical interest due to the