Accepted Manuscript

High temperature oxidation behaviors of Ni_3Al-bonded cermets

Bin Huang, Xianchen Tang, Yanping Chen, Hao Cheng, Junhan Yang, Weihao Xiong

PII: S0925-8388(17)30450-4

DOI: 10.1016/j.jallcom.2017.02.034

Reference: JALCOM 40762

To appear in: *Journal of Alloys and Compounds*

Received Date: 9 November 2016

Revised Date: 28 January 2017

Accepted Date: 5 February 2017

Please cite this article as: B. Huang, X. Tang, Y. Chen, H. Cheng, J. Yang, W. Xiong, High temperature oxidation behaviors of Ni_3Al-bonded cermets, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.02.034.

High temperature oxidation behaviors of Ni_3Al-bonded cermets

Bin Huang[1]*, Xianchen Tang[1], Yanping Chen[1], Hao Cheng[1], Junhan Yang[1], Weihao Xiong[2].

1. Institute of Materials, China Academy of Engineering Physics, Mianyang 621900, China
2. State Key Laboratory of Material Processing and Die and Mould Technology, Huazhong University of Science and Technology, Wuhan 430074, China

Abstract

High temperature oxidation behaviors of Ni_3Al/Ni-bonded cermets were studied in this paper and results revealed that mass gain of Ni_3Al-bonded cermet is less than that of Ni-bonded cermet at different oxidation temperatures and the mass gain is in accord with oxidation equation $(\Delta m/S)=k_n \cdot t^{0.6}$, in which oxidation rate constant, k_n, at 800□, 900□ and 1000□ is 0.157, 0.912 and 2.27 respectively. High temperature oxidation kinetic of Ni_3Al-bonded cermet belongs to quasi-parabolic kinetic behavior. Moreover, oxidation mechanisms and oxidation morphology of Ni_3Al-bonded cermet were also investigated. During high-temperature oxidation, Ni_3Al binder would be oxidized, forming double oxide, $NiAl_2O_4$, which can restrain the diffusion of oxygen in oxide, resulting in an improvement of oxidation resistance of cermet. The cross section morphology of oxidized Ni_3Al-bonded cermet is comprised of oxide layer (OL), transformed layer (TL), and substrate. Obviously, some pores can be observed in OL and also slight pores exist in TL. Thickness of OL of Ni_3Al-bonded cermet increased with temperature increasing and keeping time prolonging. In oxidation process, Al, Ti etc. would diffuse outwards to OL from inside of cermet and O_2 would diffuse inwards into cermet forming oxygen permeable zone, namely transitional layer.

Keywords: Ni_3Al-bonded cermets; High temperature oxidation; Oxidation kinetic; Diffuse.

1. Introduction

Ti(C,N)-based cermets bonded with Ni or/and Co, are promising