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High temperature oxidation behaviors of Ni₃Al-bonded cermets

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Abstract

High temperature oxidation behaviors of Ni₃Al/Ni-bonded cermets were studied in this paper and results revealed that mass gain of Ni₃Al-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 °C, 900 °C and 1000 °C is 0.157, 0.912 and 2.27 respectively. High temperature oxidation kinetic of Ni₃Al-bonded cermet belongs to quasi-parabolic kinetic behavior. Moreover, oxidation mechanisms and oxidation morphology of Ni₃Al-bonded cermet were also investigated. During high-temperature oxidation, Ni₃Al binder would be oxidized, forming double oxide, NiAl₂O₄, which can restrain the diffusion of oxygen in oxide, resulting in an improvement of oxidation resistance of cermet. The cross section morphology of oxidized Ni₃Al-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 Ni₃Al-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 O₂ would diffuse inwards into cermet forming oxygen permeable zone, namely transitional layer.

Keywords: Ni₃Al-bonded cermets; High temperature oxidation; Oxidation kinetic; Diffuse.

1. Introduction

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

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