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Arc erosion behavior of Ag/Ti_3AlC_2 electrical contact materials

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Abstract

Ti_3AlC_2 (TAC) has the potential to replace CdO as the reinforcement in Ag matrix for applications in electrical contacts. The arc erosion behavior of Ag/10 wt.%Ti_3AlC_2 (Ag/10TAC), Ag/20 wt.%Ti_3AlC_2 (Ag/20TAC) and commercial Ag/CdO contact materials were investigated under 100A/400V/AC. The morphology, the microstructure, the thickness loss, and the mass loss of the materials were investigated. The Ag/10TAC contact demonstrated comparable arc resistance to the Ag/CdO. The Ag/20TAC demonstrated severe arc erosion. The arc erosion mechanism for the Ag/TAC composites was proposed. The good wettability between the Ag and the TAC restricted the flow and splash of Ag in the molten pool, which strengthened the resistance to arc erosion.

Keywords: MAX, powder metallurgy, metal matrix composites, contact material, arc erosion, microstructure

1 Introduction

Ag-based electrical contacts have been a crucial component in low voltage switching devices, where they have wide application in various industries, including electric apparatuses, automobiles, airplanes, and space shuttles [1]. Ag/CdO composites are a universal material in electrical contacts, due to its outstanding electrical contacting properties [2]. There are environmental concerns of Cd toxicity, resulting in a desire to find substitute materials for Ag/CdO [3]. Various non-toxic

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