Politechnika Śląska

Wydział Mechaniczny Technologiczny

Rozprawa Doktorska

„Kształtowanie struktury i właściwości użytkowych powłok kompozytowych na osnowie kobaltu wzmacnianych *in situ* węglikiem tytanu w procesie napawania laserowego”

mgr inż. Tomasz Poloczek

PROMOTOR:

dr hab. inż. Damian Janicki, prof. PŚ

Shaping the structure and properties of cobalt-based composite coatings reinforced by *in situ* synthesis of titanium carbide by laser cladding

ABSTRACT

The dissertation presents the results of research on the possibility of shaping the structure and properties of cobalt-based alloys (type Stellite 6) fabricated by laser cladding. Effect of the concentration of elements in the Co-Cr-W-C-Ti alloy on the possibility of *in situ* synthesis of titanium carbide was subjected to a detailed analysis. In particular, the effect of the addition of titanium and carbon on the ability to control the reinforcing phase content and morphology was investigated. In this paper the commercial Co-Cr-W-C coatings as well as composite coatings reinforced by *in situ* synthesis of TiC phase were subjected to erosive wear resistance tests with the determination of mechanism of erosive wear.

As a result of conducted research, it was proved that in the process of laser cladding with tungsten modified Co-Cr-W-C powder it is possible to obtain homogenous composite coatings reinforced by TiC. The conducted research indicate that control of the chemical composition of the liquid metal pool allows shaping the concentration, morphology and size of the TiC reinforcing phase. The obtained results determined the effect of titanium and carbon on formation of eutectics consisting of chromium carbides, which is a typical reinforcing phase in Co-Cr-W-C alloys. It was proved that presence of a reinforcing phase in the form of TiC carbides has direct effect on increasing erosive wear resistance at the impingement angle of 30°, while maintaining high resistance to erosive wear at the impingement angle of 90°.

Keywords: laser cladding, cobalt based alloys, Stellite 6, erosive wear, in situ TiC