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ROZPRAWA DOKTORSKA

Struktura i właściwości zmodyfikowanej Ti lub Ag warstwy wierzchniej miedzi w procesie stopowania laserowego

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Abstract

As part of our own research, the chemical composition was modified using Ti and Ag powders in the surface alloying process using the fiber laser, Ytterbium Laser System YLS-4000-S2T on the M1E copper surface.

The crystal structure of A1, FCC type copper is the reason for very good functional properties of copper, such as thermal and electrical conductivity - the regular crystal lattice minimizes electron scattering and the large number of free electrons in the conduction band allows easy flow of electric charges. Nevertheless, copper is subject to modifications that allow for the expansion of its applications by increasing its mechanical properties through alloying and strengthening with intermetallic phases, and heat treatment, including the use of high-energy technologies that allow for the modification of the chemical and phase composition in the surface layer.

Mechanical properties were tested, including measuring hardness at low load and abrasion resistance using the ball-on-plate method, measuring physical properties including conductivity, as well as structural tests using light microscopy, scanning and transmission electron microscopy and X-ray phase analysis. Structural and diffraction studies of thin foils in a transmission electron microscope confirmed the occurrence of β and θ phases in the RZ zone of the α matrix in the case of Ti alloying, which phases are responsible for strengthening the Cu surface layer. Furthermore, the research also confirmed the occurrence of Cu+Ag eutectic at the interface of the α phase in RZ zone in the case of Ag alloying.

Key words: laser alloying, surface modification, copper