Abstract

The paper presents the results of structural analyses with phase identification of the powder material and the sprayed Fe-Al coatings in the DGS process, with particular emphasis on the oxide phases in the structure of the tested material. Thermophysical tests were carried out to determine the thermal stability of the coatings as well as tests for abrasive wear resistance under dry friction conditions using the pin-on-disc method were conducted.

As part of the work, the literature was reviewed, describing the characteristics of intermetallic phases from the Fe-Al system, including phase transformations and susceptibility to the in situ formation of oxide phases under the conditions of thermal spraying of protective coatings. Commonly used thermal spraying technologies of Fe-Al protective coatings were also presented, with particular emphasis on the gas detonation spraying (DGS).

The main purpose of the study was to analyse the degree of oxidation of FeAl powder particles in an energy-balanced stream of gaseous products of detonation combustion and the impact of oxide phases formed in situ in the DGS processon the structure and thermophysical properties of the Fe-Al intermetallic coating including specific heat, conductivity and thermal diffusivity and linear coefficient of thermal expansion.

Based on the analysis of the obtained research results, the most important technological and structural factors affecting abrasive wear in the conducted dry friction tests were determined.