Correlation between preparing conditions, starting materials morphology and the interface structure of the Cu-Al$_2$O$_3$ composites

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Abstract:

Copper/alumina composites with different volume content are used where high thermal conductivity, high absorption and dissipation of heat, high resistance to thermal fatigue and good frictional wear resistance are required. The properties of these composites depend on the content, shape and distribution of the ceramic phase in metal matrix. All these conditions have influence on said properties and, in consequence, on the future applications of the final material. In the technology of thruster and components in aircraft engines composite materials powder preparation process becomes very important. It should assure the uniform distribution of reinforcement in the matrix and eliminate of any agglomerates which cause the formation of porosity in the final product. The aim of this paper is elaboration of the mechanical alloying conditions for composite powder consists of copper as a plastic matrix and brittle aluminium oxides as a reinforcement phase. The materials by compositions Cu-5$_{vol.}$%Al$_2$O$_3$ and Cu-15$_{vol.}$%Al$_2$O$_3$ were obtained by hot pressing technique. The research methodology includes a microstructure analysis of composites structures, its connection with the strength of Cu/Al$_2$O$_3$ interfaces. The results also were analyzed and discussed in terms of the effects of different form of aluminium oxide powder (α-Al$_2$O$_3$ and electrocorundum) on the composites properties.