Nanocomposites and nanomaterials

Study of thermal stability of nanosized tungsten carbides and oxides in copper matrix

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The thermal stability of nanosized tungsten carbides and oxides at elevated temperatures up to 1200 C is studied with the means of differential scanning calorimetry (DSC) in air, argon and copper melts to determine the possibilities of copper matrix alloys reinforcing with nanopowders. The study aim is to develop modes of consolidation components of the copper based alloy matrix composites with discrete nanoscale particles by identification of solid and liquid state reactions of synthesized tungsten carbides and oxides particles as result of reaction and formation secondary compounds with chemical elements of matrix. The arming nanoscale particles were obtained by electric-spark dispersion (ESD) [1, 2].

Nanoscale carbide powders obtained by ESD in hexane at the temperature range 188 – 667 °C, have isomorphic transition of hexagonal tungsten carbide via isomorphic transformation of carbide by layering inadvertent adjustment.

Nanoscale oxide powders were obtained by ESD with distilled water consists of oxides and hydroxide mix. The hydroxide tungsten decay in argon takes place in two stages and accompanied with rapid weight loss and absorption of heat. First stage is at 123 °C, the second – 183 ° C. Up to 914 °C are identified five exothermic peaks (322.4, 506.2, 545.3, 583.6 and 914.7 °C), repeated in temperature cycles and related with structural transitions.

General result that in common ESD synthesized nanosized carbide powder is more thermally stable compared to oxides in the temperature range of possible solid and liquid state consolidation with copper matrix.

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2. *Zatulovsky A.S. , Scheretsky O.A. , Shcheretsky V.O.* Composite materials for tribotechnical purposes reinforced with nanoscale particles Nanoscale systems and nanomaterials: research in Ukraine // Edited by A.G. Naumovets. - K.: Akademperyodyka. - 2014. - P. 389 - 394.