SHS OF TiC – NiCrBSi BINDER COMPOSITE POWDERS[1]

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Iron and nickel base water or nitrogen sprayed powders are widely used for sputtering and cladding of wear resistant coatings. NiCrBSi powders are the most often used. High hardness and wear resistance of the coatings are provided by disperse particles of refractory compounds (borides, carbides and silicides) uniformly distributed in the metal matrix. However insufficient hardness and eagle-like shape of the inclusions limits a positive impact of the inclusions on the coatings properties. It is known [1], that additional introduction of disperse titanium carbide particles into the coating structure results in considerable hardness and wear resistance gain of the laser cladded coatings. An advantage of the titanium carbide under other metal carbides is a maximum hardness and equal-axes shape of the inclusions. The most effective method to introduce TiC particles into metal matrix is self-propagating high temperature synthesis (SHS) in reactive powder mixtures of titanium, carbon and metal or alloy resulting in the metal binder [2].

In the present work phase composition and structure of "TiC - NiCrBSi alloy binder" metal matrix composite powders have been investigated. The composite powders were produced by crushing of SHS cakes. The cakes were synthesized from titanium, black carbon and Ni77Cr15Si3B2 alloy reaction powder mixtures. According to X-ray diffractometry basic phases in SHS products are titanium carbide of non-stoichiometry, carbon deficit composition and nichrome: chromium – nickel solid solution. The total content of the strengthening phases (carbides, borides and silicides) does not exceed 8 %.

By microstructure investigation of SHS products it was found, that an average size of the carbide inclusions in the metal binder falls monotonously as NiCrBSi powder content in reactive mixtures rises. (fig. 1). Dependence of this type is typical for reactions in the mixtures with thermally inert dopants [2]. The reason is a burning temperature drop (fig. 2) by the alloy powder, that is not involved in the reaction.

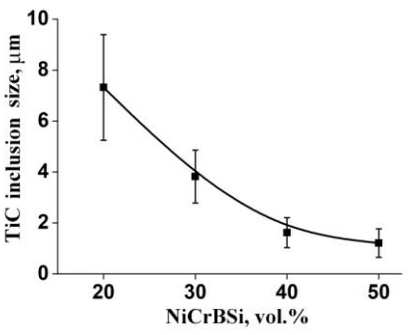

Fig. 1. Volume binder content in SHS powders dependence of TiC inclusion size

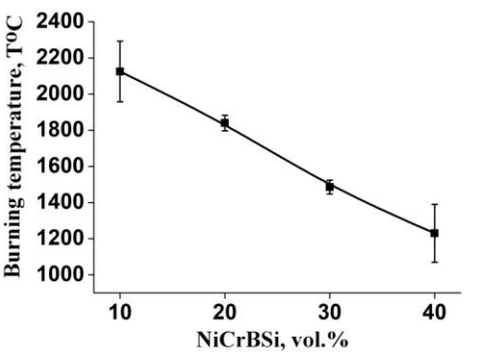

Fig. 2. Volume binder content in SHS powders dependence of burning temperature

The synthesized powders were used for electron beam cladding and for plasma sputtering of the coatings. The cladded coatings have abrasive wear resistance up to 2,5 times above, than that cladded by Ni77Cr15Si3B2 powder while hardness increase does not exceed 30 %.

REFERENCES

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