

## STUDY OF NANODISPERSED COMPOSITIONS BASED ON TITANIUM

<sup>1</sup>Hlushkova D, <sup>1</sup>Kalinina N., <sup>1</sup>Bagrov V, <sup>1</sup>Stepaniuk A., <sup>2</sup>Oles Honchar

<sup>1</sup>*Kharkiv National Automobile and Highway University, Kharkiv*

<sup>2</sup>*Dnipro National University, Dnipro*

**Purpose.** The purpose of work was to study a problem of obtaining high-melting nanodispersed compositions with tailor-made crystallographic parameters for structural steels modifying.

**Methodology.** Materials and methods for nanodispersed compositions obtaining, methods of nanoparticles crystallographic parameters researching, studying of structural steels mechanical and working characteristics.

The study of size and crystallographic structure of nanocompositions was conducted with use of transmission electron microscope ЭМ-125 at 100000 times magnification and diffractometer ДРОН 2,0 in Cu-ray.

**Results.** Analysis of powders crystallographic characteristics, particles electron microscopic images and their microdiffraction patterns show that finely dispersed composition artificially created with plasma-chemical synthesis belongs to solid crystalline compounds. SiC, Ti(CN) saved their ability for self-faceting and represent discrete three-dimensional system. This contributed to plasma gas volume condensation during plasma-chemical synthesis, which allows particles to have free crystallizing surface, which is confirmed in studies. By revising of mechanical tests data set it was defined that in result of modifying with nanodispersed Ti(CN), strength and plastic steels characteristics are increasing:  $\sigma_B$  and  $\sigma_{0,2}$  average increase is 20%;  $\delta$  – 23%;  $\psi$  - 6%.

Obtained data of modified steels characteristics testing can have important practical meaning as they allows to take reasonable choice of composition and nanomodifier sized-crystallographic parameters.

The scientific trend of farther researches expect to study structure changes of steels modified by nanodispersed compositions.

### Conclusions

1. Ti(CN) particles apparently serves as centers of crystallization allowing to obtain steel dispersed composition and thereby a high level of mechanical properties.

2. By structural steels mechanical characteristics data set analysis it was defined that titanium carbonitride modifying increase strength and plastic characteristics averagely on 20%; impact toughness has the biggest increase (on 40%).

3. The efficiency of nanodispersed compositions use in industrial conditions of structural steels with increased mechanical characteristics complex producing was determined.

**Key words:** nanodispersed composition, modifying, plasma-chemical synthesis,

### References:

1. Nikiforchyn, H. Chapter 2: Physical and mechanical properties of surface nanocrystalline structures// Nanocomposites, Nanophotonics, Nanobiotechnology and Applications/
2. V. Kuryliv, O. Maksymov, O. Fesenko, L. Yatcenko. – Inbunden: Springer, 2014. – P. 31–41.
4. Barsoum, W. Max-Phases: Properties of Machinable Primary Carbides and Nitrides. John Wiley and Sons. – Weinheim, Germany, 2013. – 126 p.
5. Калинина, Н.Е. Получение нанодисперсных модификаторов для обработки жаропрочных сплавов [Текст] / Н.Е. Калинина, О.А. Кавац, В.Т. Калинин // Авиационно-космическая техника и технология. – 2007. – №8(44). – С.41-44.