



NATIONAL METALLURGICAL ACADEMY OF UKRAINE

THE WAYS OF MANUFACTURING WEAR-RESISTANT COMPOSITE MATERIALS AND MICROCOMPOSITE STEELS

Purposes and implication

Wear-resistant composite material based on Fe-W-Cr and Fe-Mo-Cr alloys is made by means of forming **carbide inclusion-matrix** in the surface layer of composite structure. The alloy production uses the new physical principles of structure formation. The parts are manufactured in the process of chemical and thermal treatment with the employment of standard production equipment. **Implication:** high speed cutting tool. The ways of receiving composite microzones with micro and nanophases in steels during high temperature treatment with the addition of non-metallic inclusions as inner source of microalloying. Phase and structural transformations on the boundary **non-metallic inclusion-matrix** is possible with the implementation of new physical principles. **Implication:** machinery and mechanism parts, tools, rail wheels.

Indicators of scientific significance of the technology

Indicators of the operational properties of the tool made of composite material

Wear-resistant material	Hardness, HRC	Tool resistance, min	Wear per 35 min, mm
On the basis of Fe-W-Cr	61	132	0.22
On the basis of Fe-Mo-Cr	62	144	0.18

Operational properties of wear-resistant composite material guarantee significant improvement of a range of mechanical and operational properties of high speed cutting tool and production process does not require expensive alloying elements.

Intellectual property rights protection

Two patents for the utility model registered in Ukraine. One patent claim is registered in Ukraine.

Specifications

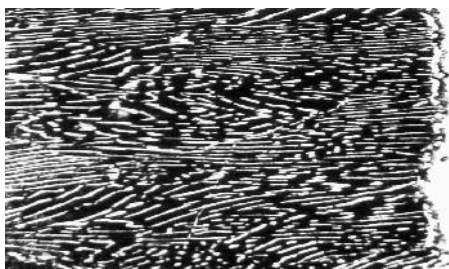
Resistance of the tool made of new wear-resistant material increases by 30...40%, wear-resistance increases by 55...65% in comparison with the best national analogues. Laser treatment increases tool strength and wear-resistance 1.32...2.06 times as much as without the treatment. Strength increases by 30%, plasticity by 30...40% after high temperature annealing.

Market demand

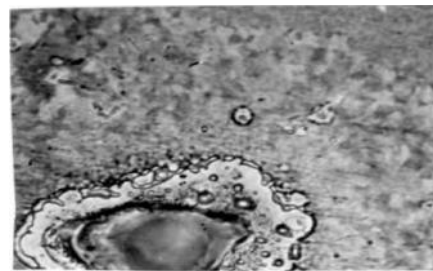
Machinery and metallurgical plants in Ukraine, railway depots need high quality cutting tools as well as high strength and wear resistant steels for machinery and mechanism parts.

Availability of the technology

Pilot samples, confirmed expected characteristics. It is necessary to complete experimental study and provide normative documentation.



a



b

Wear-resistant composite material based on Fe-W-Cr and Fe-Mo-Cr alloys (a) and microcomposite steel structure after laser treatment.