Materials of Conferences

THEORETICAL PRECONDITIONS OF NEW KINDS OF NUCLEAR PROTECTIVE METAL COMPOSITE MATERIALS DEVELOPMENT BASED ON FERRIC AND BISMUTH OXIDES CAPSULATED INTO METALLIC ALUMINUM MATRIX

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Nowadays there are topical tasks in the nuclear protective building materials science for working out new kinds of materials with high nuclear protective and strength characteristics, efficient under conditions of dynamic, alternate temperatures and combined radiation loads, resistant to high repeated temperature drops.

Such materials can be presented by composite materials combining plastic metallic skeleton (aluminum, lead, copper, tin etc.) and solid metallic and nonmetallic reinforcing components both of natural and artificial origin (granite, basalt, limestone, dolomite, quartzite, marble, metallurgical slag, ashes, expanded clay, ferric oxide systems and others) [1]. Particularly, there is a practical interest to elaboration of the metal-composite material based on highly dispersed ferric oxides (magnetite, hematite) and bismuth oxide capsulated into metallic aluminum matrix.

The use of ferric oxide fillers will allow to increase physico-mechanical and nuclear protective properties of the composite (resistance to high-energy fields of γ-radiation impact); bismuth will enhance the ability to scatter heat neutrons almost without absorption; aluminum matrix application as a binding agent would give unique properties of aluminum: high degree of workability (the material will be well pressed and can take plastic deformation), elevated heat conductivity and ability to reflect heat flows.

On my opinion, further development of scientific aspect of elaboration and manufacture of such metal composite materials and, as a consequence, the design of modern nuclear protective engineering constructions on its base would play a great role in the field of nuclear protective building materials science.

References

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THE IMPROVEMENT OF STAINLESS STEELS MACHINING PARAMETERS AT THE USE OF CUTTING WITH ADVANCED PLASTIC DEFORMATION

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The improvement of stainless steels machinability is an important problem of the contemporary engineering. Learning nature of physical processes in the zone of cutting gives opportunity to change and manage the parameters of the machining. One of the methods of efficient improvement of metal machining is cutting with advanced plastic deformation (APD).

Cutting with APD concludes in combination of two processes – surface plastic deformation, creating necessary depth and extent of work hardening and consequent removal of the hardened metal in the shape of facings. Thereby there are created conditions, promoting the improvement of firmness of the cutting instrument and the quality of work.

The research was undertaken for a turning cut of austenitic stainless steel 12X18H10T (according to State Standard GOST, Russia) at semifinishing and finishing modes in a wide range of cutting speeds. The cutting instrument was presented as wolframium- cobalt, walframium-titanum-cobalt, walframium-titanum-tantalum-cobalt, non- wolframium carbide blades. The measurements of uneveness were done and profilograms of the finished surfaces were written down, the runout of the back age of the carbide blade and other parameters of the cutting process were fixed. The depth of advanced hardening, created by knurling group was chosen according to the depth of cut-