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 cutting. Aim of the research was to find out character of APD influence on formation of unevenesses of the finished surface and on runout of the cutting instrument.

Analysis of the experimental data, obtained for different machining mode combinations, showed that unevenness after cutting APD is less than after traditional cutting. When using the experiment method not only modulus of center-line-average surface finish Ra (mkm) occurs. When cutting with APD this parameter of quality corresponds to finishing work, and when using traditional cutting at the same modes (speed and depth of cutting,supply) – semifinishing. That means that in some cases the method allows reducing quantity of technological transits, necessary to get the required level of unevenness. Positive impact of APD is also proved by profilograms of microasperities of the finished surfaces (height of microasperities of the surfaces finished with APD is lower and their profile is more stable). Reduction of rates of wear of cutting blades while finishing with APD was fixated.

Formation of unevenesses of the finished surface and runout of the cutting instrument are defined by the character of interaction of cutting instrument, forming facing and the finished surface. Processes in the zone of cutting (zones of contact interaction and formation of facings) are determined by temperature-deformation principles of high-speed plastic deformation. Except mode parameters of fulfilling the finishing, simultaneous interaction of features of instrument and finishing materials, subject of conditions, forming mechanisms of contact interaction and stipulating change of types of facing formation, is considerably determined by mechanical and thermophysical characteristics of the finishing material. Mechanical (firmness, strength, ductility) and thermophysical (thermal conduction, thermal capacity) features of steel determine intensity of heat output and heat outflow in the zone of cutting, load on cutting wedge of the instrument, change of types of contact interaction. While finishing with APD resistance to deformation and parameters of heat output in the zone of cutting should differ from the case of traditional finishing and consequently conditions of separation of metal of the cut layer and finished surface and conditions of contact interaction should change. Change of the features of the hardened metal should provide more favorable conditions of contact interaction to reduce intensity of runout of the cutting instrument and getting less unevenness of the finished surface.

Thus, cutting with APD is an effective method of workability of stainless steels. In a number of cases reduction of unevenness allows reducing quantity of necessary technological transits, and by that improving efficiency of the finishing. Reason for such influence of APD should be favorable change of process parameters in the zone of cutting.

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COMPLEX AND RATIONAL USE FISH RAW MATERIAL AT PRODUCTION OF THE FISH PRODUCTS

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There was developed resource saving technology of herring preserves, which allows to rationally use raw, to cut lasting of the technological process, to lower the production costs and rise the economical effectiveness of production. There were defined the optimal conditions of getting broths of herring wastes. There were developed the recipes of fills at the base of broth from collagen-containing wastes of herring with the addition of vegetable raw.

Preserves of aquatic are delicacy products, which are always demanded by consumers. While the production of reserves the taste, the smell and consistence, which is peculiar to ripen salted fish, form while the salting because of the processes of hydrolysis of protein and lipids of muscular tissue, oxidation of lipids and reactions of synthesis between them. At the same time there is universally recognized the fact of inhibition with sodium chloride of the process of biochemical ripening of salted fish (introduction of the salt leads to the slowdown of ripening). There was developed the resource saving technology of preserves from herring, which allows to rationally use the raw, to shorten the lasting of technological process, to lower production costs and rise economical effectiveness of production [1].

The use in the fish production of deep cutting of fish leads to the forming of collagen-containing wastes (skin, fins, bones), which are reasonable to use for getting fish broth. Introduction of such technologies into the production allows not only to spread the assortment of food products from hydrocoles, but also to solve actual problem of rising of level of food use of extracted