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BOOK OF ABSTRACTS

Working ability of surface ultra-fine grainstructure under conditions of cavitation and erosion damage

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The formation of nanocrystalline (NCS) and ultra-fine grain structures (UFGS) after severe plastic deformation (SPD) is one of the promising methods for improving the physical and mechanical properties of materials. These methods include vibration-centrifugal hardening (VCH), which forms a superficial UFGS of considerable depth due to the large contact stresses in the processing zone due to the considerable mass of the reinforcing tool [1]. Optimal parameters of the VCH during cold plastic deformation ensure the formation of a ferritic UFGS of construction steels with a grain size on the surface up to 200 nm, a high dislocation density and significant microstrains in the lattice. The microstructure at a depth of 1 mm is more fragmented. Its microhardness amounts to 8.9 GPa, and a depth of strengthening – 6 mm. Dependence of the parameters of the hardened layer on the treatment modes, increasing its wear resistance under conditions of oil wear and oil-abrasive wear, as well as the improvement of its corrosion and electrochemical parameters under the corresponding VCH conditions are shown in [2]. VCH of steel 40Kh and its influence on the resistance to cavitation and erosion damage has been studied in this work. The results show that after VCH resistance to cavitation and erosion damage increases 2 times. Such an increase is attributable to the high microhardness of the surface layer and its increased wear resistance under cavitation conditions.

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