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Resistance of surface nanostructures and ultrafine grain structures on steel 40Kh to wear and cavitation-erosive destruction

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Abstract

Wear resistance in oil and in conditions of dry friction, as well as resistance to cavitation-erosion destruction (CED) of samples made of steel 40Kh with a surface nanocrystalline and ultrafine grain structure formed by severe plastic deformation (SPD) by mechanical-pulse treatment (MPT) and vibration-centrifugal hardening (VCH) were studied. At the same time, for almost the same microhardness obtained by MPT, VCH forms a significantly greater thickness of the hardened layer, which makes it possible to carry out finishing operations for high-precision parts. It is shown that nanostructures and UFGS on steel 40Kh significantly reduced the friction coefficients of the test pair and its wear resistance under dry friction, as well as in oil, compared with quenching and low tempering, which is especially manifested in an oil medium by more than 2 times. It was conducted comparative studies of the stability of CED and revealed their correlation with wear resistance. At the same time, the resistance to CED depends on the processing modes, which form favorable electrochemical characteristics of the hardened surface layer.

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Ethics declarations

Conflict of interest

The authors declare that there is no conflict of interest.

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