Influence Solubility Carbide to form Element on Mechanical Characteristic Doped Steel

Ya. Rakhimov, Z. Abduqakhhorov, Sh. Imomkulov

Abstract: ***The Problem of increasing to wear capability and longevity material worker mechanism agricultural machines is actual Defining importance in shaping the features to constructive toughness material worker mechanism agricultural machines has, as is well known, variation of the structured condition. Defining importance in shaping the features to constructive toughness material worker mechanism agricultural machines has, as is well known, variation of the structured condition. For this purpose article is studied structured conversions become under different type of the thermal processing, which vastly affect the specified characteristic.***

Keywords: toughness, wear capability, toughness, limit to fluidity, striking viscosity, longevity, defects crystalline lattices, density dislocation, grain.

I. INTRODUCTION

To improve the wear resistance and durability of machine parts, various methods of hardening are used. However, in some cases, the working surfaces of power transmission components (transmission shafts, etc.) work not only under conditions of friction and wear, but also experience shock-cyclic loads. In this regard, improving the reliability and durability of machine parts by applying hardening technologies largely depends on the formation of hardened layers with high resistance to brittle fracture in a wide temperature rang

Currently, there are many methods for increasing the durability of materials of machine parts - these are mainly different variants of chemical heat treatment.

The variation in the structural state is of decisive importance in shaping the characteristics of the structural strength of the materials of the working mechanisms of technological machines. The possibilities of changing it by traditional methods of volumetric heat treatment are almost exhausted. At the same time, new horizons are opened up by the regulation of the final structure due to the directional change of the starting (initial) structure immediately preceding the realization of the final heat treatment stage. This can be achieved by implementing known or developing original schemes and heat treatment modes at the preparatory heat treatment stage.

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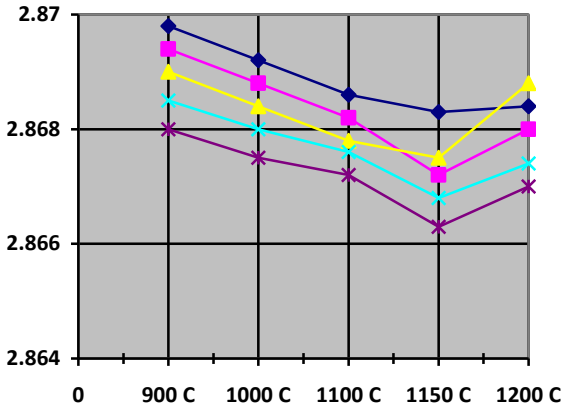
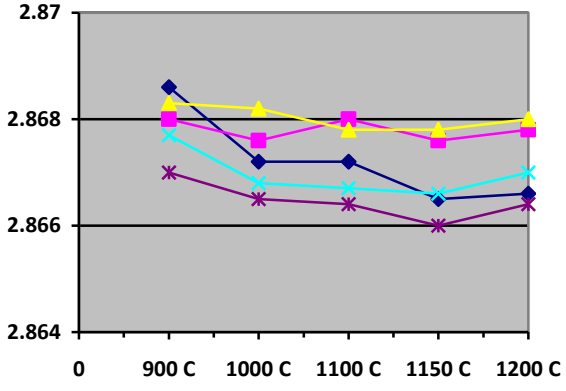
II. EXPERIMENTAL PROCEDURES

One of the possible options for improving the technology and improving the service properties of thermally processed products is the use of heat treatment with multiple heating, including phase recrystallization [1]. The essence of the method of heat treatment with double phase recrystallization in the optimal mode is to create the necessary thermal history of steel. During the first phase recrystallization, heating is performed to extreme temperatures of 1100 ° C for carbon and low alloy steels diffusion is already significant [3], a certain regularity of the lattice period is observed depending on the thermal history of steel

The lattice period of the α-phase of alloyed steels depends on the pre-quenching temperature and is minimal if it is 1150 ° C.





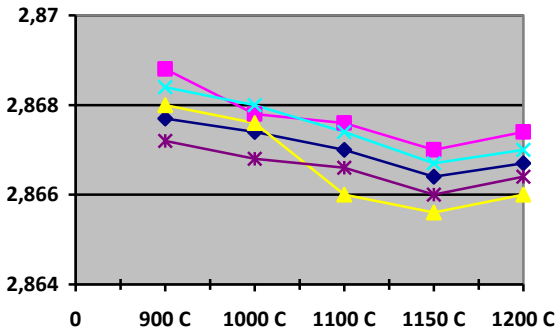


Fig. 1. Change of the steel grating period depending on the pre-quenching temperature of intermediate tempering.

After accelerated cooling from these temperatures, a structure is formed with the maximum level of imperfection of the crystal structure. When high-temperature heating occurs, the dissociation of refractory nitride, carboxylic acid and oxygen-containing phases and their transition into a solid solution. This process is intensively taking place in the region of 1100 ° C heating temperatures. The beginning of the dissolution of these phases is characterized by chemical micro heterogeneity of the nitride solid solution. In this case, upon cooling, with γ - α transformation, a structure with an increased level of crystal structure deficiency is formed [2].

During cyclic heat treatment, there is also an increase in the density of dislocations, which should be associated with the development of microplastic deformation during abrupt heat cycles. The increase in the density of dislocations depends on the temperature - time cycling conditions, the possibility of inheriting the elements of the substructure in the new heating-cooling cycle.

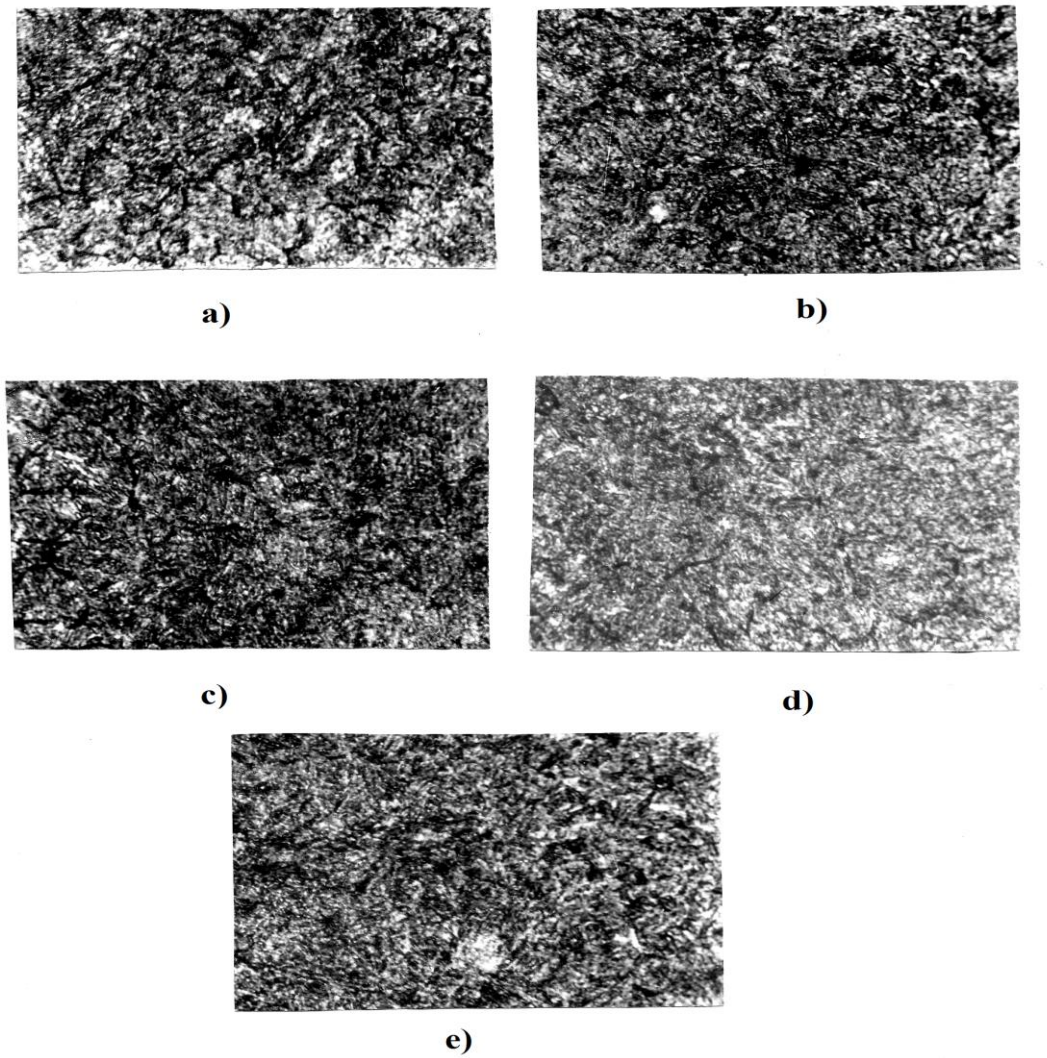
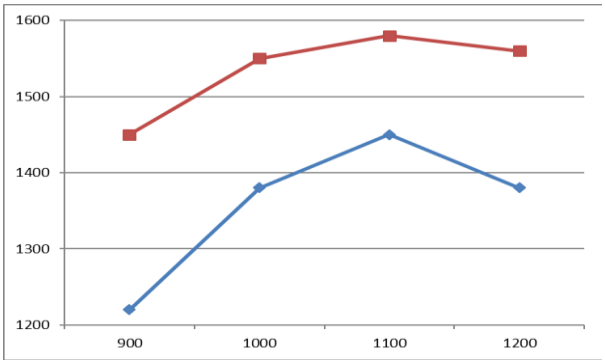


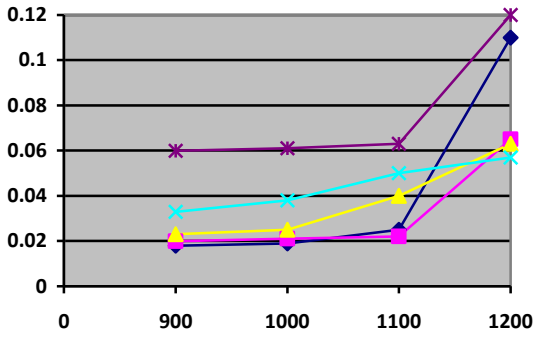
Fig.2. The microstructure of steel 5 ChNM after repeated thermal processing: hardening 870 °C; pre-hardening a) 870 °C; b) 1000 °C; c) 1100 °C; d) 1150°C; e) 1200°C

However, after the final quenching and tempering, the dislocation density is not much different from that obtained after quenching and tempering in the usual modes. At present, a large number of thermo cyclic treatment methods have been developed for various alloys [3]



Pre-hardening temperatures ° C Figure 3. Change of yield strength, toughness, depending on the prehardening temperature

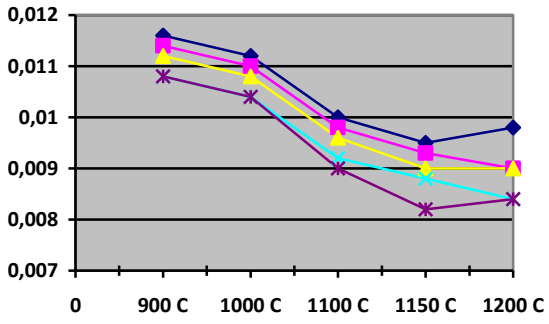
Another way to sharply accelerate diffusion processes is to increase the process temperature. However, these processes had obviously negative sides - grain growth, increase in embrittlement temperature, etc.

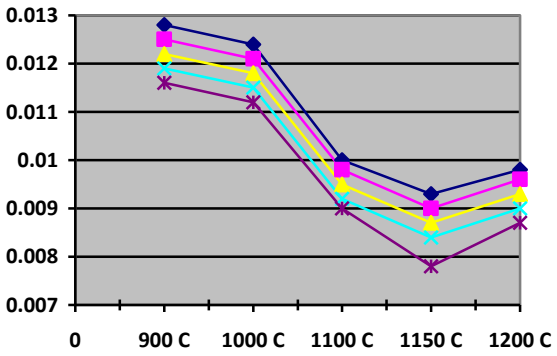


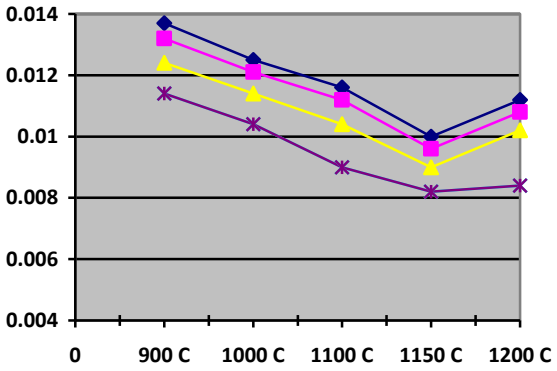
Pre-hardening temperatures ° C Figure 3. Growth of the average diameter of austenitic grain depending on the pre-quenching temperature.

III. RESULTS AND DISCUSSION

Therefore, a more acceptable process is heat treatment with double phase recrystallization. In particular, during the same years, Japanese patents were published, which described the double hardening of ball bearing steel, which several times increased the durability of ball bearings. This was due to the grinding of grain and secondary steel carbides. More complete studies on the formation of the structure of steel during heat treatment with double phase recrystallization have shown that there are optimal modes that ensure the refinement of







Pre-hardening temperatures ° C

Figure 4. Growth of the average diameter of austenitic grain depending on the pre-quenching temperature and intermediate tempering.

These modes include the first phase recrystallization with heating to extreme temperatures. As LI Mirkin showed, for carbon and low-alloy steels, the extreme temperature falls to 1100 ° C.

After heating the steel to this temperature and cooling forms an increased dislocation density. Our work showed that extreme temperatures cover a wider range of 1100 - 1150 ° C, and the formation of the maximum defect structure of the crystal structure is associated with the beginning of the dissolution of the refractory impurity phases in steel, the formation of zones with chemical microheterogeneity, which during cooling leads to an increase in the dislocation density α - phase [4].

Repeated phase recrystallization, carried out with heating of usually accepted temperatures, takes place in the conditions of inheritance of elements of the initial sub microstructure. Thus, after a new α - γ - α transformation, a structure is formed with a high dislocation density, a fine grain, and dispersion phases.

This contributes to a marked increase in the elastic limit and yield strength of steel, an increase in the relaxation resistance and a significant increase in wear resistance.

IV. CONCLUSION

The heat treatment technology with double phase recrystallization was used to increase the wear resistance of the blades of the shotgun apparatus, the cold forming tool for stamping, increase the efficiency of the elastic retaining rings of high-pressure chambers, and the traction drums of the drawing machines. In all cases, a significant increase in durability was achieved from 1.5 to 3 times without significantly complicating the technology on existing equipment.

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