FORMATION OF THE STRUCTURAL STATE AND ITS INFLUENCE ON THE PROPERTIES OF PARTS OF TECHNOLOGICAL MACHINES

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Abstract: The Problem of increasing to wear capability and longevity material worker mechanism agricultural machines is more 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.

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

Introduction

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

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].

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The essence of the method of heat treatment with double phase recrystallization under the optimal mode is to create the necessary thermal prehistory of steel. During the first phase recrystallization, heating is performed to extreme temperatures of 1100°C for carbon and low-alloy steels. After accelerated cooling at these temperatures, the structure with the maximum level of defect in the crystal structure is formed. When high-temperature heating occurs dissociation of refractory nitride, carbon nitride and oxygen-containing phases and their transition to a solid solution. This process is intensive in the area of heating temperatures of 1100°C. The beginning of dissolution of these phases is characterized by the chemical micro-uniformity of the solid solution. In this case, during cooling, during the γ-α transformation, a structure with an increased level of defect in the crystal structure 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 sharp heat changes. The growth of dislocation density depends on the temperature and time conditions of Cycling, the possibility of inheritance of substructure elements in a new heating-cooling cycle. However, after the final quenching and tempering, the density of dislocations does not differ much from that obtained after quenching and tempering under normal modes. Currently, a large number of methods of thermocycle processing have been developed for certain alloys [3].

Another way to dramatically accelerate diffusion processes is to increase the process temperature. However, these processes were obviously the negative side is the grain growth, the increase in temperature embrittlement, etc.

Therefore, heat treatment with double phase recrystallization looks more acceptable. In particular, in 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 steel structure during heat treatment with double phase recrystallization have shown that there are optimal modes that ensure the grinding of austenitic grains, the dispersion of excess phases and the maximum density of dislocations. These modes include the first phase recrystallization with heating to extreme temperatures. As shown by L. I. Mirkin, for carbon and low-alloy steels, the extreme temperature is 1100°C. After heating the steel to this temperature and cooling, an increased dislocation density is formed. Our work has shown that extreme temperatures cover a wider range of 1100-1150°C, and the formation of the maximum defect of the crystal structure is associated with the beginning of dissolution of refractory impurity phases in steel, the formation of zones with chemical micro – inhomogeneity, which leads to an increase in the density of dislocations in the α-phase [4].

Repeated phase recrystallization, carried out with heating of usually accepted temperatures, takes place under the conditions of inheritance of elements of the original submicron structure.

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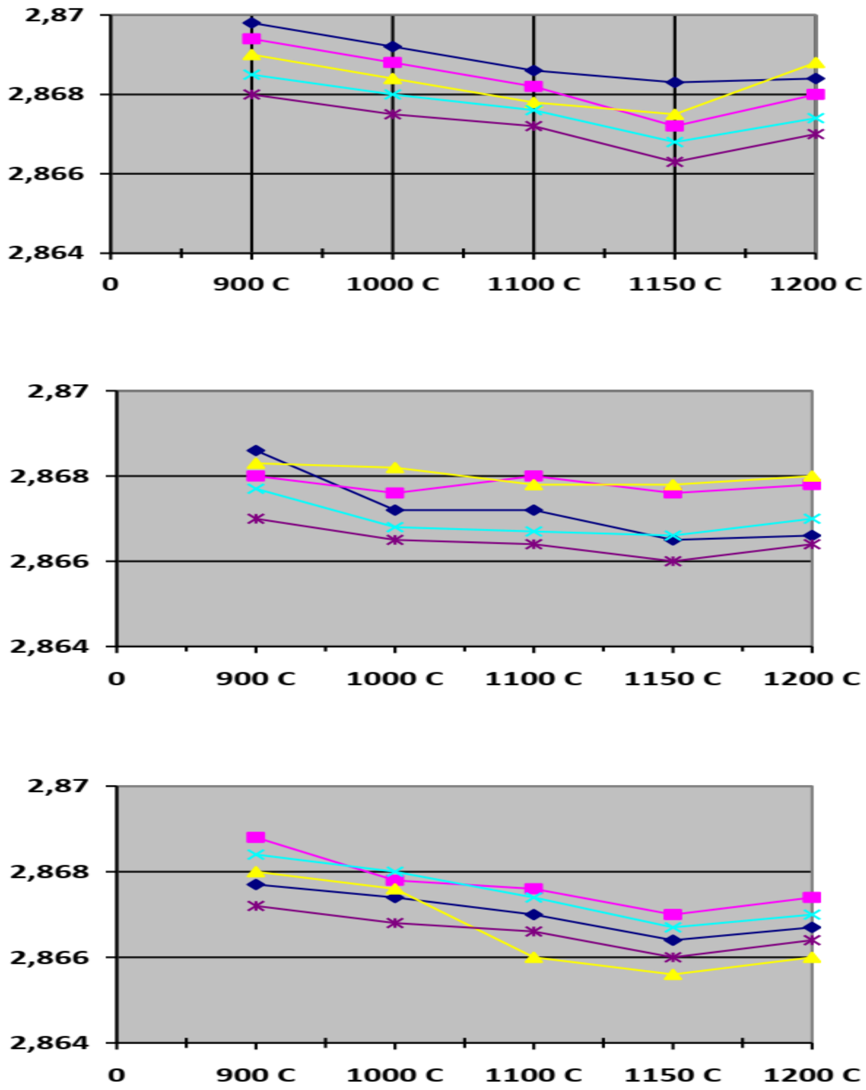
Thus, after a new α-γ-α transformation, a structure with a high density of dislocations, fine grain, and dispersion phases is formed.



pre-quenching temperature °C

Fig. 1. Change in the grating period of 45x steel depending on the pre-quenching temperature of the intermediate tempering.

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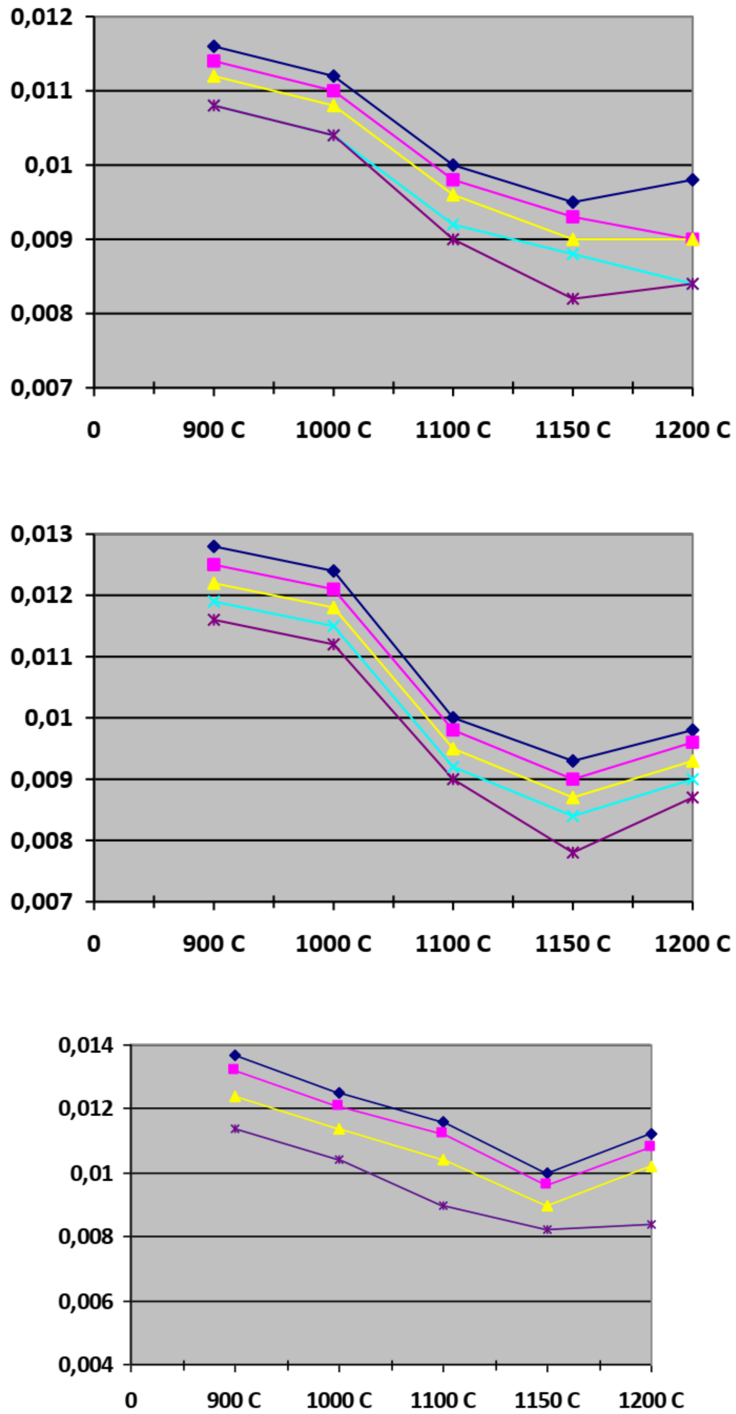

Pre-quenching temperature °C

Fig 4. Growth of the average diameter of austenitic steel grain 45X depending on the temperature of pre-quenching and intermediate tempering

This contributes to a noticeable increase in the elastic and yield strength of steel, increased relaxation resistance and a significant increase in wear resistance.

The technology of heat treatment with double-phase recrystallization was used to increase the wear resistance of shotgun blades, cold-forming die tools, improve the performance of elastic band rings of high-pressure chambers, and traction drums of 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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