

## DISCUSSION

### ON THE ISSUE OF SCIENTIFIC TERMS IN CONTEMPORARY METAL SCIENCE

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The article of Yu. I. Ustinovshchikov “Role of Interatomic Chemical Interactions in Formation of Structure of Metallic Alloys under Heat Treatment” in Issue No. 6 of the journal “Metal Science and Heat Treatment” of 2023 is devoted to principal theoretical aspects of the science of metals. However, we assume that the concepts put forward by the author deserve discussion. For this reason, we think is appropriate to set out our opinion on this article.

We will start with the terms used. An expression “atom(ic) particles” is encountered more than once. It is not clear what part of an atom is implied. It seems more correct to speak of “particles (precipitates) consisting of atoms” of the component in question.

As for the “ordering – separation” reaction, we think it more appropriate to speak of the combination of “ordering – disordering” states of the material. Separation should be understood as a result of formation of an inhomogeneous solid solution, i.e., a solution having locally different concentrations (within one and the same phase) in contrast to a chemically homogeneous solid solution. In this connection, it would be more appropriate to speak of a combination of “homogeneous solid solution – separation.”

It is not clear what the author means when he speaks of quenching. The canonical understanding of this operation is known to be reduced to the mode of heat treatment aimed at formation of an extremely nonequilibrium system in the form of a supersaturated solid solution. This can be observed

both in the systems with polymorphic transformation (for example, in steels) and without the latter (in classical aging alloys). The role of tempering (aging) is to bring the alloy to a relatively equilibrium state due to decomposition of the supersaturated solid solution accompanied by precipitation of fine particles of a second phase.

In the introduction to his article, Yu. I. Ustinovshchikov describes quenching as applied to the Fe – Cr system and considers the alloys with chemical composition getting into the single-phase  $\gamma$ -range. How can a quenched condition be attained in this case? The chemical (concentration) supersaturation does not occur here, and it is possible to speak only of supersaturation of the solid solution with respect to defects (vacancies). Then we may ask what the author understands under quenching and tempering.

To a certain extent, our remarks may be generalized to the Ni – Mo system too.

The aim of any mode of heat treatment consists in formation of such a structural state that would provide the required properties (often a set of properties). The author says nothing about this. If the author suggests an approach eliminating the quenching operation or replacing it by tempering (and what is tempering in his understanding?), it would be logical to substantiate this suggestion by demonstrating the properties of the steel. Otherwise, the suggestion seems poorly grounded and having no practical sense. This allows us to protest against eliminating the quenching operation and preserving only tempering.

In conclusion, we would like to note that we are offering our arguments as an invitation to a scientific discussion.

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