SIMULATION USING NEURAL NETWORKS EXPERIMENTS WITH DEVELOPMENT SINGLE BINARY INTERLAYERS IN METAL ENVIRONMENTS

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The special attention paid to the question of the nature of deformation twinning is due to it important value in specific practical tasks related to selection of materials, modes of their production and operation.

The paper [1] studied experimental data on the creep of twin boundaries and their behavior in sign-changing and pulsating loads. As a result, a phenomenological model of the development of single double layers in metal crystals under different load regimes was proposed. This phenomenological model was obtained taking into account some assumptions and has the form of a parametric family of an ordinary differential equation.

Next, the authors study this basic equation for different load modes. This is basic for each load mode equation turns into another differential equation, but all these equations have an analytical solution under some assumptions.

It is worth paying attention to the result obtained in the case of the regime of alternating sign loads. The found approximate formula for the measure of the Bauschinger effect during twinning within the limits of the phenomenological consideration outlined above shows that, most likely, it makes sense to consider a fractal model in a more advanced analysis.

In addition, it is worth investigating the obtained model precisely as a family of differential equations using the methods of the mathematical theory of catastrophes, because otherwise it is possible to miss a bifurcation point.

The paper [1] studied experimental data of small deformations under small loads. In paper [2], experimental data of plastic deformation under high loads were obtained. Experiments were carried out on modern equipment. A cube of single crystal copper with a purity of 99.99% and a thickness of 2 mm was used in the case of the sample. The authors obtained the shear stress distribution of the sample at the initial stage of bending on the basis of finite element analysis. The authors did not put forward any mathematical model based on the results of the experiment.

From the point of view of the importance of this topic, we consider it expedient to use neural networks with the addition of expert data for practical application.

References:

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