Application of machine learning in the theoretical research of AL-CU alloys behavior during deformation

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In this paper, we use the complex approach to deformation modelling of aluminium-copper alloys under loading with high strain rate. Two artificial feedforward neural networks (ANNs) were used for define elastic constants and calculate pressure for various concentrations of aluminium in a copper crystal. The training data set for the ANNs is obtained by modelling uniaxial and hydrostatic compression and tension of crystals by the method of molecular dynamics. Plastic deformation is calculated by the modified Maxwell model [1] with dislocation nucleation [2]. The Bayesian method is used to select model parameters. The model is used to investigate the structure of shock wave in this alloy depending on the concentration of elements.

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[1] Popova T V, Mayer A E and Khishchenko K V 2018 *J. Appl. Phys.* **123**

[2] Latypov F T, Mayer A E and Krasnikov V S 2020 *Int. J. Solids Struct.* **202** 418–433