ICSMA19 Metz, France, June 26 - July 1, 2022
International Conference on Strength of Materials

Theoretical description of martensite transformation in beta-Ti alloys

Tomáš Škraban[a], Josef Stráský[a], Dalibor Preisler[a], Hanuš Seiner[b]

[a]Department of Physics of Materials, Charles University, Ke Karlovu 5, 12116 Praha, Czech Republic
[b]Institute of Thermomechanics of the CAS, Dolejškova 1402, 18200 Praha 8, Czech Republic
Corresponding email: tskraban@seznam.cz

The applications of materials exhibiting shape memory effect, superelasticity or transformation-induced plasticity (TRIP) can be found e.g. in medicine or aerospace industry. These phenomena are caused by diffusionless martensitic transformation, which is an instantaneous organized movement of atoms by a fraction of lattice parameter. Martensitic transformation of material affects its mechanical properties. It can be described by theory of continuum mechanics, and phase interfaces can be determined by kinematic conditions. Application of these models for the description of phase interfaces in beta titanium alloys is quite rare. Our objective was to develop means of description or even prediction of microstructure of Ti-Nb-Zr based beta-Ti alloys. Programming language Python was chosen for its easy use and availability to a wide range of users. In this work the experimental data are compared with theoretical results of the used models. Model accuracy, its comprehensiveness with respect to observed phenomena and overall usability to describe alloys of this type are discussed.

Keywords: martensitic transformation, titanium alloys, modelling, twinning