ТЕЗИСЫ ДОКЛАДОВ

МЕЖДУНАРОДНАЯ КОНФЕРЕНЦИЯ

**«Физическая мезомеханика.
Материалы с многоуровневой иерархически организованной структурой и интеллектуальные производственные технологии»,**

посвященная 90-летию со дня рождения
основателя и первого директора ИФПМ СО РАН
академика Виктора Евгеньевича Панина

**в рамках
Международного междисциплинарного симпозиума
«Иерархические материалы: разработка и приложения
для новых технологий и надежных конструкций»**

**5–9 октября 2020 года
Томск, Россия**

Томск
Издательство ТГУ
2020

DOI: 10.17223/9785946219242/33

THE EFFECTS OF SURFACE-LAYER GRAIN SIZE AND TEXTURE ON PLASTIC STRAIN LOCALIZATION AND DEFORMATION-INDUCED SURFACE ROUGHENING IN COMMERCIAL PURITY TITANIUM HARDENED BY ULTRASONIC IMPACT TREATMENT

[1,2]Emelianova E.S., [1]Romanova V.A., [1]Balokhonov R.R., [2]Pisarev M.
[1]*Institute of Strength Physics and Materials Science SB RAS, Tomsk*
[2]*National Research Tomsk State University, Tomsk*

The ultrasonic impact treatment (UIT) of titanium specimens leads to the grain refinement and formation of a strong basal texture in the surface layer, affecting the mechanical properties of the UIT titanium parts. In this paper, we aim at investigating numerically the effects which the UIT-modified microstructure has on the micro- and mesoscale deformation behavior of titanium specimens subjected to uniaxial tension. For this purpose, three-dimensional polycrystalline models taking an explicit account of the grain morphology and crystallographic orientations of the base material and UIT modified surface layer are generated by the method of step-by-step packing and implemented in the finite-element calculations. The constitutive models describing the nonlinear behavior of individual grains are implemented in terms of anisotropic elasticity and crystal plasticity theories. The boundary value problem is solved within a dynamic approach using the ABAQUS / Explicit package. This study allows distinguishing between the grain size and texture effects and drawing conclusions on their roles in the stress-strain evolution, plastic strain localization and deformation-induced surface roughening in UIT titanium specimens under loading.

This work is supported by Russian Science Foundation (Project No. 20-19-00600).