



.....

# «MIST: Aerospace - 2020: Advanced Technologies in Aerospace, Mechanical and Automation Engineering»

.....

«The Influence of Thermocyclic Treatment on the Structure and  
Mechanical Properties of Pseudo-Alpha Titanium Alloys for Steam  
Turbine Blades»

Authors: Vladimir Gadalov,  
Irina Vornacheva, Sergey Voinash,  
Vitaly Ignatenko and Eugene Remshev



# Problem statement

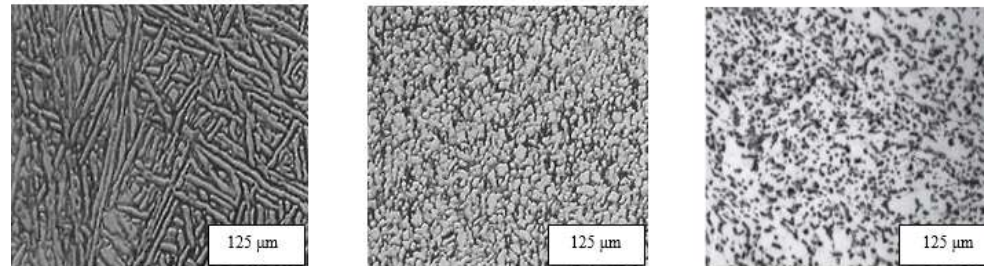
- Problem statement
- Steam turbine blades are subjected to significant mechanical and thermal stress.
- Therefore, today the question of the development of effective methods for their hardening is quite acute.
- It can be assumed that enhanced mechanical properties of pseudo- $\alpha$ -titanium alloys can be obtained as a result of the formation of a finely dispersed globular microstructure in them.



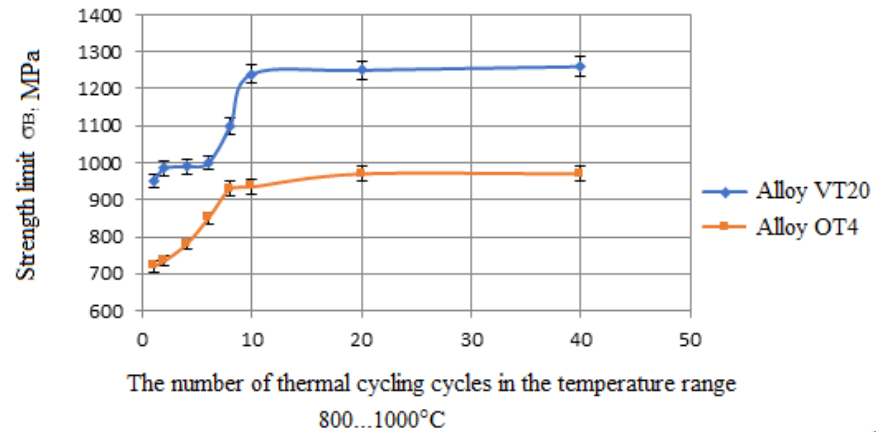
# Solution methods

Science and Technology City Hall  
KRASNOYARSK, RUSSIA

- Thermal cycling treatment
- Pseudo- $\alpha$ -titanium alloys OT4 and VT20
- IMASH ALA-TOO 20-75 unit



Type of microstructures of the VT20 alloy: a - during annealing at 880°C, for 2 hours; b - as a result of thermal cycling (1100-800°C) with a duration of 6 cycles; c - as a result of thermal cycling (1100-800°C), duration 12 cycles



Dependences of the ultimate strength  $\sigma_B$  of VT20 and OT4 alloys on the number of TCT cycles



**MIST: Aerospace**

Advanced Technologies in Aerospace,  
Mechanical and Automation Engineering



# Conclusions

## Results, implementation

- Thus, the substructure formed as a result of thermal cycling of pseudo- $\alpha$ -titanium alloys ensures their increased strength properties both at low and at elevated temperatures without the danger of alloy destruction.
- The research carried out is of great practical importance for the development of durable, reliable materials for the production of steam turbine blades.

# Contacts

Irina Vornacheva

South-West State University, 305040, Russian Federation,

Kursk, 50 Let Octyabrya, 94

E-mail: [vornairina2008@yandex.ru](mailto:vornairina2008@yandex.ru)