Inamura Lab

Research on the basic principles of microstructure and discovering new approach for material design

Division of Materials Integration, Laboratory for Materials and Structures
Advanced Materials Research Core, FIRST

http://www.mrst.first.iir.titech.ac.jp/inamura_tit/english/

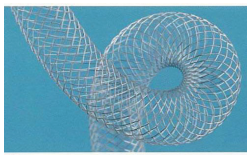
Research interest

The main focus areas of our research group are (1) microstructure of diffusionless transformation, (2) kink deformation in layered material, (3) Recrystallization and texture, (4) shape memory alloys, (5) biomedical titanium alloy and (6) steels.

Research Topics

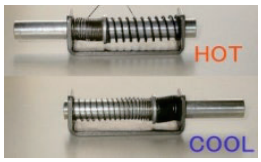
Long-life shape memory alloys (SMAs)

Improvement of fatigue properties
by controlling domain structure of martensite



Biomedical devices

Waste heat utilization

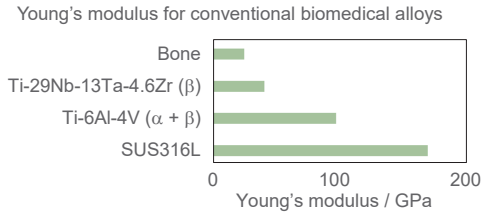


Actuators

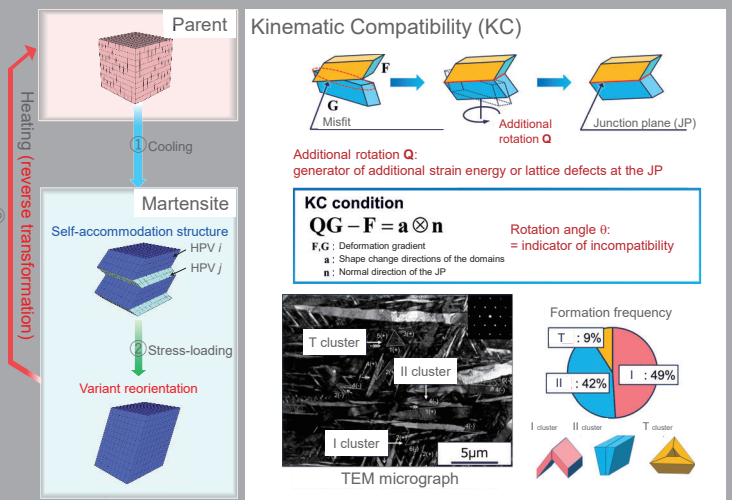
Low Young's modulus (YM) biomedical alloys

Decreasing the YM for preventing mismatch
between bone and implant materials

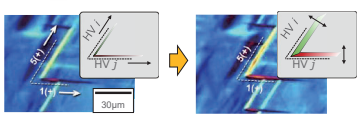
Bone fixation materials



Martensite microstructure analysis based on crystallographic theory

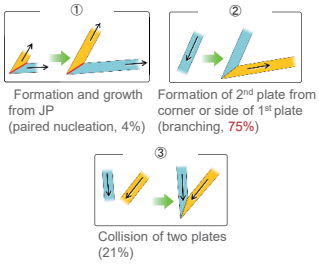


In-situ observation of
HPV cluster formation process
(ex: I cluster)



① Increasing in length of HPV
② Increasing in thickness of HPV

Observed type of formation process
and fraction formed

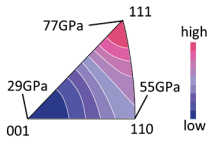


① Formation and growth from JP (paired nucleation, 4%)
② Formation of 2nd plate from corner or side of 1st plate (branching, 75%)
③ Collision of two plates (21%)

A considerable majority of I clusters form by paired nucleation or branching.

Reducing YM by texture controlling

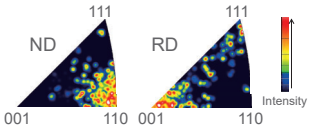
Orientation dependence of YM
in β-Ti alloys



YM is minimum along <001>

Texture controlling
→Reducing YM

Recrystallization texture
in Ti-Mo-Al-Zr alloys



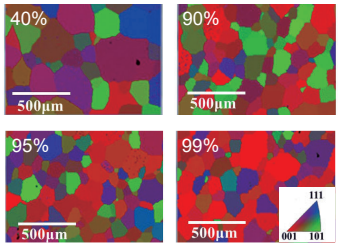
ND: Normal direction
RD: Rolling direction

Goss orientation
{110}<001>
→Irregular texture components of
β-Ti alloys

<001>//RD
→Useful orientation for YM reduction

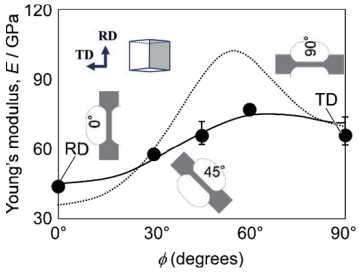
Microstructure and mechanical properties in Ti-Mo-Al-Zr alloys

Cold-Rolling rate dependence
of recrystallization texture



Cold-rolling rate ↑
Goss orientation ↑

Loading direction dependence
of YM



YM along RD decreased
by around 40 GPa