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

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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 Low Young's modulus (YM) biomedical alloys (SMAs) Improvement of fatigue properties Decreasing the YM for preventing mismatch by controlling domain structure of martensite between bone and implant materials Young's modulus for conventional biomedical alloys - HHHHH Bone Ti-29Nb-13Ta-4.6Zr (β) Ti-6Al-4V ($\alpha + \beta$) SUS316L 0 100 200 **Biomedical devices** Waste heat utilization Actuators Bone fixation materials Young's modulus / GPa Martensite microstructure analysis **Reducing YM by texture controlling** based on crystallographic theory Parent Kinematic Compatibility (KC) Recrystallization texture Orientation dependence of YM in β -Ti alloys in Ti-Mo-Al-Zr alloys 111 77GPa high R Additional rotation Q: 29GP 55GPa generator of additional strain energy or lattice defects at the JP 001 110 001 Martensite KC condition 110 001 ND: Normal direction $QG - F = a \otimes n$ Self-accommodation structure Rotation angle 0: YM is minimum along <001> RD: Rolling direction indicator of incompatibility Goss orientation Textured Random {110}<001> Thermomechanical Formation frequency \rightarrow Irregular texture components of β-Ti alloys T :9% RD Stress-loading TD 🕇 · 42% Texture controlling ant reorientation <001>//RD →Reducing YM →Useful orientation for YM reduction Microstructure and mechanical properties in Ti-Mo-Al-Zr alloys TEM micrograph Cold-Rolling rate dependence Loading direction dependence 120 Young's modulus, *E /* GPa In-situ observation of of recrystallization texture of YM Observed type of formation process HPV cluster formation process and fraction formed (ex: I cluster) RD °06 Œ 2 TD TD ° Formation and growth Formation of 2nd plate from corner or side of 1st plate 60 RD from JP (branching, 75%) 4%) 30 1 Increasing in length of HPV 30 60°

2 Increasing in thickness of HPV

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

Collision of two plates (21%)

Cold-rolling rate ↑ Goss orientation ↑

