

# DEPARTMENT OF MECHANICAL ENGINEERING WILLIAM MAXWELL REED SEMINAR SERIES

## High-Temperature Superelasticity in Ferromagnetic Single Crystals with Thermoelastic Martensitic Transformation

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**Abstract:** The research on temperature interval of superelasticity in dependence of crystal axis orientation, stress state (tension/compression) of ferromagnetic Ni-Fe-Ga (A), Co-Ni-Ga (B), Co-Ni-Al (C) single crystals in monophase and aged state is carried out. These single crystals undergo thermoelastic martensitic transformations from high-temperature B2-phase in tetragonal L10- martensite (alloys B, C) and from L21-phase in 10M, 14M and L10 martensite. It is shown, that the temperature interval of superelasticity is defined by two factors: 1) the strength properties of a high-temperature phase; 2) the yield stress to the beginning of stress-induced martensitic transformation. The maximum temperature interval of superelasticity TSE (400 K (A), 450 K (B), 250 K (C)) in monophase crystals is reached, when crystals are "hard" in a high-temperature phase and "soft" at development stress-induced martensitic transformation. The increasing of strength properties of high-temperature phase by the precipitation of dispersed particles leads to increase temperature interval TSE by 50÷150 K as compared to monophase crystals. The thermodynamic criterion for development of high-temperature superelasticity is suggested.

**Bio:** Dr. Yuriy Chumlyakov is the Head of Laboratory of Siberian Physical Technical Institute at the Tomsk State University in Tomsk, Russia. He also is Professor of the Physical Faculty, Department of Metals Physics at the Tomsk State University. Dr. Chumlyakov received his Diploma and his Ph.D. and Doctor of Science degrees from the Tomsk State University. After completing his Diploma and Ph.D., Dr. Chumlyakov has worked at Siberian Physical Technical Institute for 23 years as a Junior Research Worker, Senior Research Worker and Head of the laboratory of the Physics of Strength and Plasticity, before starting his career in academia as Professor at the Tomsk State University in 1993.

Professor Chumlyakov's major interest are in physics of thermoelastic martensitic transformation in single crystals of Ti Ni and new ferromagnetic crystals Ni Mn Ga, Co Ni Ga, Ni Fe Ga, Co Ni Al and mechanisms of plastic deformation and fracture of high strengths FCC and BCC single crystals. He has published about 200 articles and is the holder of several patents in these areas. Professor Chumlyakov is a Member of Editorial Board, Journal of Physics of Metals and Metallography, Russian Academy of Science, George Miller Professor, University of Illinois at Urbana-Champaign, USA, Co-Guest Editor Special Issue on Shape Memory Alloys, ASME Journal of Engineering and Technology, JSPS Fellowship at University of Tsukuba, Japan, Russian Foundation for Basic Research, CRDF and Russian Ministry of Education Grants Recipient, Permanent Jury Member of Ph.D. and Doctor of Science Councils of Tomsk State University, Tomsk, Russia.

**Date: Thursday, November 12, 2009**

**Time: 3:30 p.m. to 4:30 p.m. (refreshments 3:00 p.m.)**

**Place: Room 323 CRMS Building**

**Contact: Dr. Haluk Karaca, 257-6336 ext. 80666**

Meet the speaker and have refreshments  
Attendance open to all interested persons