J Material Sci Eng 2013, 2:4
http://dx.doi.org/10.4172/2169-0022.S1.012

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Materials Science & Engineering

October 07-09, 2013 Hampton Inn Tropicana, Las Vegas, NV, USA

Alpha-beta transition in quartz

H. Yurtseven
Middle East Technical University, Turkey

Quartz exhibits the α-β transition through the incommensurate phase at Ti= 847.2 K. This intermediate phase (IC) occurs in a narrow temperature interval (~1.3 K) between the α and β phases.

In this study, we investigate the temperature dependence of the thermodynamic quantities such as the thermal expansion and specific heat close to the α-β transition in quartz. In the vicinity of the α-IC-β transition, the critical behavior of the specific heat Cp , in particular, is described by a power law formula with the critical exponent a. Also, critical behavior of the Bragg peak intensity related to the order parameter due to a tilting of SiO_2 tetrahedra around the threefold axis is analyzed close to the α-IC-β transition by a power-law formula with the critical exponent b.

Other aspects of our study on the α-β transition in quartz are to predict the Raman frequencies of a soft mode which drives this crystalline system to the transition, using the volume data through the mode Grüneisen parameter. We have extended this work to calculate the Raman frequency in the case of SiO_2-moganite close to the α-β transition.

We also predict the temperature dependence of the damping constant (bandwidth) using the Raman frequency related to the order parameter by the soft mode-hard mode coupling model and the energy fluctuation model close to the α-β transition in quartz. For all these analyses and calculations, experimental data from the literature are used and our predicted values are discussed within the framework of some other theoretical models to explain the mechanism of the α-IC-β transition in quartz.

Biography

H. Yurtseven received his Ph.D. degree at the King's College London, University of London, England in 1984. He had worked at the Ankara University from 1985 to 1987. For one year (1988-1989), he did research work at the University of Rome, Tor Vergata, Italy. Then, from 1987 to 2003, he worked at the Istanbul Technical University, Istanbul, Turkey. Since 2003, he has been working at the Middle East Technical University.

hamit@metu.edu.tr

Elemental concentration profiles in carbon and boron coated Ti6Al4V alloy after nitrogen ion implantation

F. Cerny
Czech Technical University in Prague, Czech Republic

The Ti6Al4V alloy samples were divided into two groups for application of two varied combinations of deposition and ion implantation. On the first group of samples, the carbon nanolayer and on the second group of samples the boron nanolayer were deposited by electron beam evaporation. Two values of thickness of nanolayer were chosen in both groups, 20 nm and 40 nm. After deposition, the ion implantation of nitrogen into samples of both groups was carried out. The energy of ions was 90 keV and the fluence of nitrogen atoms was $1x10^{17}cm^{-2}$. The depth distribution of elements in samples was analyzed by Auger electron spectroscopy. For both samples coated with carbon nanolayer at the interface between the carbon nanolayer and the substrate, a titanium oxide layer was present. In this layer, elements like aluminum and vanadium were depleted. The nitrogen atoms penetrated to different thicknesses and different maximum values for nitrogen concentration were found. The nitrogen concentration was very low in the top most carbon layer. In carbon layer, the nitrogen atoms were mainly located at the surface region. Also in case of the samples coated with the boron nanolayer, the titanium oxide layer was found at the interface between the deposited nanolayer and the substrate. Nitrogen atoms were distributed from the surface towards the inner part of the substrate.

Frantisek.Cerny@fs.cvut.cz