DF 16: Phase Transitions

Time: Thursday 14:00–15:25 Location: H11

Invited Talk DF 16.1 Thu 14:00 H11

Succesive phase transitions in $(Gua)_4SO_4Cl_2$ crystal - dielectric, pyroelectric, dilatometric and optical studies — •Zbigniew Czapla[1,2], Artur Rokosa[1], Slawomir Dacko[1], and Boguslaw Kosturek[1] — [1]Institute of Experimental Physics, University of Wrocław, pl M. Borna 9, 50-204 Wrocław, Poland — [2]Department of Physics, Opole Unoversity of Technology, Ozimska 75, 45-271 Opole, Poland

Te studies of dielectric and pyroelectric properties along the ferroelectric a - axis, optical observation along the b-axis and dilatometric measurements along the a-, b- and c- axes for of $(Gua)_4SO_4Cl_2$ crystal were performed in the temperature range 330-380 K covering the phase transitions region at various heating/cooling rates regime. Presented studies on heating run at the rate 0.01 K/min showed the successive phase transitions at $T_2 = 353$ K and $T_1 = 357.5$ K with the symmetry changes according to the scheme: orthorhombic(III) - orthorhombic(II) - tetragonal (I) and on cooling: tetragonal (I) - orthorhombic (II). The dielectric, pyroelectric, dilatometric and optical studies allowed to conclude that the phase transition III-II at T_2 is characterized by slow kinetics. The studies of permittivity and dimensions changes of the samples which were kept at constant temperature inside of phase II during 180 min gave some detailed information about kinetics of III-II phase transition. The time changes of permittivity and dimensions were describe using Avrami model.

5 min. break

DF 16.2 Thu 14:45 H11

Common characteristics of displacive and relaxor ferroelectrics — •Annette Bussmann-Holder — Max-Planck-Institut für Festkörperforschung, Heisenbergstr. 1, D-70569 Stuttgart

The long standing classification scheme of ferroelectrics into either relaxor or displacive ones (the phase transition is driven by a soft phonon mode) is shown to be too restrictive since a smooth crossover between them exists which even admits for a coexistence of both phenomena. This crossover and coexistence is a consequence of the varying density of polar nanoregions due to different doping levels of the respective system. The formation of polar nanoregions is attributed here to intrinsic local modes (ILM) in terms of discrete breathers. Consequences for the dynamics, temperature effects and line width broadening are discussed.

DF 16.3 Thu 15:05 H11

High-pressure structure of Pb-based relaxor ferroelectrics — •Bernd J. Maier[1], Ross J. Angel[2], William G. Marshall[3], Boriana Mihailova[1], Carsten Paulmann[1], Jens M. Engel[4], Marin Gospodinov[5], Anna-Maria Welsch[1], Dimitrina Petrova[5,6], and Ulrich Bismayer[1] — [1]Mineralogisch-Petrographisches Institut, Universität Hamburg — [2]Crystallography Laboratory, Virgina Tech, Blacksburg, USA — [3]ISIS neutron facility, STFC Rutherford Appleton Laboratory, Chilton, Didcot, Oxon, UK — [4]Institut für Werkstoffwissenschaft, Technische Universität Dresden — [5]Institute of Solid State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria — [6]South-West University "Neofit Rilski", Blagoevgrad, Bulgaria

The pressure-induced phase transitions that occur in the perovskite-type relaxor ferroelectric $PbSc_{0.5}Ta_{0.5}O_3$ (PST) and $Pb_{0.78}Ba_{0.22}Sc_{0.5}Ta_{0.5}O_3$ (PST-Ba) were studied with combined neutron powder diffraction and single-crystal X-ray diffraction. An increase in the intensities of h,k,l = all odd reflections is observed while the intensity of h,h,h peaks, $h = 2n+1$, does not change with pressure, indicating a glide-plane pseudo-symmetry of the structural distortion along the $\langle 111 \rangle$ cubic directions. Rietveld refinement to the neutron powder data shows that the high-pressure phase has either $R\bar{3}c$ or $R\bar{3}$ symmetry, depending on whether the presence of 1:1 octahedral cation ordering is neglected or taken into account, and comprises anti-phase octahedral tilts of type $a^-a^-a^-$ that continuously evolve with pressure.