PS10.04.13 SYMMETRY RELATIONSHIPS IN THE 
HOMEOTYPICAL ALUMINUM-RICH STRUCTURES 
WITH PENTAGONAL CHANNELS. M. Ellner, U. Burkhardt 
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A significant feature of some homeotypical aluminum-rich structures with transition metals (TM) is the occurrence of finite 
or infinite pentagonal channels, which is dependent on chemical 
composition i.e. the stoichiometry of these intermetallic compounds 
is controlled by both s-, p-electrons of aluminum and d-electrons 
of TM. A phase bundle occurs in the aluminum-rich portion of 
the binary system Co-Al: Co2Als, (hP28, P63/mmc), CoAl12, 
CoAl13, m-CoAl13 (mC102-7.2, Cm) and o-CoAl13 (oP102, 
Pmn21). The homeotetical structures Co4Al13 and o-Co4Al13 form 
by two flat (AA') and two puckered (BB') layers of atoms in the 
structures with transition metals (TM) is the occurrence of finite 
armngement of atoms. Two TM

Pentagonal and rhombic clusters probably dominate the 
real structure of decagonal

PS10.04.14 X-RAY DIFFUSE SCATTERING IN 
QUASICRYSTALS: COLLECTING LARGE 
3-DIMENSIONAL DIFFRACTION VOLUMES WITH 
IMAGE PLATES Michael A. Estermann, Walter Steurer, Laboratory of 
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Strategies for collecting and analysing diffuse scattering data 
of quasicrystalline materials will be presented: Automatic indexing 
of rotation pictures from aperiodic materials [1], background analys­

is in the presence of diffuse scattering, reconstruction of arbitrary 
slices and volumes in diffraction space and data reduction. 

Diffuse scattering effects can be observed in most materials 
with one-dimensional diffraction symmetry. These effects cannot 
be explained by strict quasiperiodic ordering, various kinds 
of disorder must be considered, such as random static disorder 
or orientationally ordered nanodomain structures. The knowledge 
of the real structure of decagonal and icosahedral phases is an 
important step towards understanding their physical properties which are 
strongly determined by defects and disorder.

Our primary aim is to proceed towards a quantitative analy­
sis of the disorder effects; a number of models based on the known 
average structure of decagonal AlCoNi are currently being develop­
oped in our laboratory.

To record quantitatively large volumes of X-ray diffraction 
space we use the MarResearch imaging plate detector system which is an on-line imaging plate scanner in combination with simple 
rotation geometry. Small rotation ranges of 0.2° or even still im­
ages result in 2D spherical sections which are small enough to 
allow a complete reconstruction of the diffraction space. After 

the usual corrections for resolution, absorption and Lp effects, the 
entire measurable reciprocal space is accessible for numerical calc­
ulation.

tional Conference on Quasicrystals. Avignon, France. Editors: C. Janot 
& R Mosseri. World Scientific Publishing.

PS10.04.15 FIBONACCI CHAIN - A QUASIPERIODIC AP­
PROACH OF ONE DIMENSIONAL APERIODIC STRUCTURES. Maria Farkas-Jahnke, Research Institute for Technical 
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In aperiodic lattices built up of translationally equivalent layers - for example lattices of closed packed structures containing 
many stacking faults - only short range order can be determined 
exactly. In ZnS lattices the rate of occurrences of stackings up to 
five layers can be determined using the data of X-ray patterns of the 
sing crystals in question. The longer range order in these faulted 
crystals can be approached by Fibonacci-chains, whose elements 
are composed as suitable arrangements of these five layer structure 
elements. In this way, relatively good quasiperiodic description to 
long sequence of the faulted lattice can be given which 

PS10.04.16 STRUCTURAL STUDIES ON INCOMMENSU­
RATE-NORMAL PHASE TRANSITION IN CO­
AKERMANITE, Ca2CoSi2O7, K. Hagiya, K. Kusaka, N. Haga, 
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Since comparison between the structure of incommensurate 
phase of this compound is expected to 
be informative to elucidate origin of the modulation, the present 

studies on change of the structure at elevated temperatures have 
been carried out. Two-dimensional incommensurate phases of 
synthetic akermanite solid solution Ca2(Mg,Fe)Si2O7 were found by Hemingway[1] and Seifert[2] independently. They 
found that akermanite undergoes a reversible phase transition from 
the low-temperature incommensurate phase to the high-tempera­
ture normal phase. The modulated structures of the Co-analogue 
(Ca2CoSi2O7) was determined by us[3] based on the five-dimen­sional description. The results revealed that the modulation is 
classified by the shifts of the constituent atoms.

The specimen of the single crystal was synthesized by one of 
the authors (K.I.). Temperature dependence of intensities and that 
of the cell parameters were examined in situ to observe the change 
of the structure. A fragment of the sample was mounted in a small 

gas blow heating system installed on an Enraf-Nonius CAD-4 
diffractometer. MoKα radiation monochromatized by graphite was 
used for the measurements. The temperatures, varied from room 
temperature to 270°C with arbitrary steps, were estimated by a 
thermocouple to regulate the heating system. The intensities 
were corrected for Lorentz and polarization effects.

The intensity of the satellites steeply weakens to background 
level at about 220°C. In connection with the change, the c-axis contracts at the temperature range between 210°C to 230°C, while 
the a-axis expands and the volume of the cell is held almost const­
nt. The structures at the temperature range were analyzed careful­
ly to clarify those phenomena.