PS21.01.13 QUASIPERIODIC LATTICES AND QUASISYMMETRY SPACE GROUPS. I.N. Mochtchenko, North Caucasus Scientific Center, 140, Pushkinskaya, Rostov-on-Don, 344006, Russia

The method allowing to describe the quasicrystals as a discrete and quasiperiodic disposition of structural elements and to characterize the quasicrystal structure by means of a few parameters is presented. The central point of elaborated theory is a quasiperiodic lattice. We propose a constructive algorithm determinating the 2-dim and 3-dim discrete lattices in which the knots are disposed by quasiperiodic law with finite distance between them. The structure of quasicrystal is described by one or several such lattices occupated by atoms of different sorts and characterized by coordinates of these sublattices, the basis vectors of quasiperiodicity and space group of quasisymmetry. The last consists of one subgroup of point symmetry (it may containes noncrystallography elements such as 5-, 7-, 8-, 12-fold axises), subgroups of quasitranslations and subgroups of point quasisymmetry. The quasisymmetry elements are the approximate symmetry operations and transform lattice into itself with some error. The proposed theory is demonstrated on the example of quasicrystal with 5-fold axis symmetry. The calculated high-resolution TEM micrographs and difraction diagrams are well corresponded to experemental ones. The elaborated method is computible with the conseption of pointlike atoms which is the basis of difraction structural analysis.

PS21.01.14 LAYER HOMOLOGY GROUPS. A.F.Palistrant, A.A.Zadorozhny, Geometry Department of Moldova State University, Kishinev

Crystal homology by V.I.Miheev, affinely adequate to usual symmetry, but extending traditional classification of various crystal forms, is used to generalize layer symmetry groups.

Essence of notion of crystal homology is as follows. Let F be a finite figure, and S be its discrete symmetry group. Group H of affine transformations, obtained from symmetry group S of the figure mentioned, by means of some affine transformation σ of this figure according to the law $H=\sigma S\sigma^{-1}$ is called the homology group of the figure considered, and any $h=\sigma s\,\sigma^{-1}$ from H, where s is from S, is called the transformation of homology of the given figure. Transformations of homology of finite figure are equiaffine and transfer symmetry group S of this figure into its homology group H, and elements of symmetry of group S into elements of homology of group H.

The apperence of tablet homology groups, preserving a plane and a point on it in three-dimensional space, as well as the line crossing this plane in the mentioned point, gives the possibility to solve the task of generalizing layer symmetry groups, preserving in the same space the only plane and no point, and no line on it, up to the corresponding homology groups. The reason is that, according to the general theory, to obtain the groups we are interested in, we should use (according to the above mentioned law) such affine transformation σ for each layer symmetry group S, that the point subgroup of "rotations", being a part of group S, is transformed into one of the 145 tablet homology groups obtained earlier.

By the above mentioned method 414 layer homology groups were obtained from 80 layer symmetry groups.

PS21.01.15 AN APPARENTLY PARADOXICAL SITUATION IN SOME CENTROSYMMETRIC SPACE GROUPS. Siddhartha Ray, Department of Solid State Physics, Indian Association for the Cultivation of Science, Jadavpur, Calcutta-700032, India

In some centrosymmetric space groups belonging to the uniaxial systems, there may exist two 'polar descriptions' of the same structure depending on the choice of the positive direction of the unique axis and not interrelated by any operation of the space group. Referred to hexagonal or tetragonal axes, the corresponding sets of atomic coordinates are related by the transformation (0 1 0/1 0 0/0 0 -1) and may be assigned the arbitrary nomenclature '**c**-up and **c**-down descriptions'. This apparently paradoxical situation would arise in R$\bar{3}$, P$\bar{3}$, P4/m, P6/m and in any other space group which does not include the above transformation as one of the symmetry operations,—a fact to be considered while looking for isostructurality of two crystals with one of such space groups.

PS21.01.16 SYMMETRY-THERMODYNAMICS CONCEPTION Yu. M. Smirnov, Tver State University, 170000 Tver, Russia

The symmetry-thermodynamics conception includes symmetry analysis of thermodynamical forces and flows in both isotropic and anisotropic objects, general superposition principle of the physical properties of objects and physical fields on the basis of Curie principle, and the rule of resulting symmetry group determination in interacting systems [1].

We have studied the following interactions of thermodynamic forces and flows: scalar - axial vector - polar tensor (even rank quantities); pseudoscalar - polar vector - even rank pseudotensor. Provided a general parameter N is used to describe the tensor rank of a physical quantity having its axiality characterized by 1 or 0, the transition from general to particular for the above mentioned quantities will be as follows: 0+0; 1+1; 2+0; 0+1; 1+0; 2+1. Consider as an example the following equations [2]:

$$\Sigma = q\cdot\mathring{H};\ \ \bar{\tilde{D}} = \nu\cdot\mathring{H};\ \ \mathring{\tilde{B}} = \bar{E}\cdot\nu;\ \ \mathring{\tilde{B}} = \mu\cdot\mathring{H};\ \ \mathring{\tilde{B}} = b : \tilde{\tilde{\sigma}};\ \ \tilde{\tilde{\varepsilon}} = \mathring{H}\cdot b,$$

where Σ, $\bar{\tilde{D}}$, $\mathring{\tilde{B}}$, $\tilde{\tilde{\varepsilon}}$, $\mathring{H}$, $\bar{E}$ and $\tilde{\tilde{\sigma}}$ rT are entropy, electric induction, magnetic induction, deformation, magnetic field intensity, electric field intensity and tensor of stresses, respectively, while q, ν, b and μ are vectors or tensors of pyromagnetic, magnetoelectric, piezomagnetic effects and magnetic permeability tensor, respectively.

In these and similar cases the traditional tensor classification by magnetic (q, b), even (μ) and magnetoelectric (ν) ones appears to be unnecessary, because it is sufficient to make use of characteristics (types) of evenness and oddness. With this provision q, ν, ν, μ, b, b tensors are fully defined by (1+1), (2+1), (2+1), (2+0), (3+1), (3+1) values being classified solely as even quantities - q, b, μ and odd quantities - ν. The Curie symmetry groups for these quantities are $-\infty/m$, $(\infty/m)mm$ and $\infty 22$, respectively (in other cases subgroups with lower symmetry are possible). However the existence of $\bar{1}$ inversion is a necessary condition for even group quantities as well as its absence for odd ones.

[1] Yu. M. Smirnov, *Physics of Crystallization* (Kalinin, KSU, 1990).
[2] Yu. I. Sirotin, M. P. Shaskolkaya, *Foundations of Crystal Physics* (Moscow, 1970).