12-Amorphous, Imperfectly Ordered and Quasi-periodic Materials
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THE STRUCTURE OF THE DOUBLE PEROVSKITE Pb2CuWO6 IN ITS INCOMMENSURATE PHASE
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The perovskite exhibits a sequence of phase transitions from cubic (T > 300K) to monoclinic symmetry (T < 230K) including an incommensurate monoclinic phase in the range 300K > T > 230K. The satellites observed in this temperature range seem to be exceptional and therefore, a structural study of this particular case has been initiated.

Up to now, only the structure of the cubic phase is known. The attempt to solve the problem using current techniques seems to suggest the presence of some interesting structural elements in the structure of the incommensurate phase. The results of the incommensurate structure analysis of Pb2CuWO6 are presented here from crystals prepared by the group of H. Schenk at the University of Geneva. All the specimens exhibit multiple domains and although their existence seems to hinder seriously the process of structure analysis, it appears that they play a key role in the resolution of the structure of the incommensurate phase. The main reflections originating from the various domains are all superimposed (3000 to 5000 reflections) whereas the satellites associated with each domain are well resolved.

Based on electron microscopy observations which assign a unique pair of satellites to each single reflection, X-ray diffraction intensities have been collected on a specimen exhibiting four domains. The unique monoclinic axis could thus be identified from the refinement based on main and satellite reflections. In addition, an anti-parallel displacement of the Pb atoms could be detected from the analysis of the incommensurate structure.

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CRYSTALLOGRAPHIC APPLICATIONS OF GENERALIZED Bessel FUNCTIONS
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Recently a theory of Generalized Bessel Functions (GBFs) has been developed. The number of theoretical models and applications derived from this new field is increasing rapidly. Numerical properties and algorithms to calculate GBFs are being studied. Basic properties will be discussed and two possible applications in crystallographic computing will be presented. The analysis of incommensurate (IC) structures is computationally more difficult than of ordinary ones. This is mainly due to the structure factor expansions involving numerical integration or infinite series of ordinary Bessel Functions. Compact analytical expressions are known for special cases only. A possible application of the GBF in IC structures analysis is proposed. These functions can be used to derive analytical expressions for structure factors and their partial derivations for a wide class of IC structures. The existing programs can be improved by using these new properties of structure factors (e.g., recurrence relations, numerical expansions for derivatives, generating functions, etc.). Generalized Bessel Functions are also widely used in crystallographic statistics to derive new exact and approximate probabilistic formulates in direct methods theory and applications. Several novel expressions for joint probability density functions of several structure factors have been derived using exact random-walk techniques. Unit cell heterogeneity has also been considered in this new approach. Again, Generalized Bessel Functions have been the primary analytical tool. This approach can be used to derive new exact expressions for some joint probability density functions. The X, relationship in the space group P21 is the first example. The classical approximate formulation can be derived using asymptotic properties of these new functions. We conclude that there exists a new class of special functions suitable for dealing with several crystallographic computing problems.

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ON THE POSSIBILITIES OF MOSSBAUEROGRAPHIC STUDIES OF QUASICRYSTAL STRUCTURES
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The Mössbauer spectroscopy studies, carried out for quasicrystals Al-Fe-Me (Me-Cu, Ni, etc.) have shown, that the spectra are a superposition of poorly resolved quadrupole doublets with very close parameters, corresponding to several non-equivalent positions of Fe nuclei. A problem of these doublets separation still exists. The Mössbauerography method (Mössbauer diffraction) can be useful for its decision. It was shown in our studies, that the interference of Mössbauer radiation scattering by non-equivalent Fe atoms leads to the specific form of Mössbauer energy spectra. The line forms for constructive and destructive interference were calculated for the different distances between the resonances. (P. P. Kovalenko et al., JETP, 1985, 88, 1336-1347). The interference effects were observed experimentally both for the magnetic (I. G. Tolpekin et al., JETP, 1988, 94, 329-343) and the quadrupole (I. G. Tolpekin et al., Phys. Lett. A, 1990, 147, 323-325) hyperfine structures in the diffraction scattering by the single crystal Fe3B6C. It has allowed to determine the only possible structure among, compared by magnetic fields and the Electric Field Gradient in the crystal. If a number of non-equivalent Fe positions will be more than two, the specific