properties in self assemblied supramolecular materials, considering host-guest intergrowth crystals. A host urea molecule forms hydrogen-bonded hexagonal channels of 5.5 Å diameter in which long guest chains are densely packed in a one-dimensional arrangement [1]. This simple paradigm crystal offers a unique opportunity to address at a fundamental level the question of the nature and the roles of interactions in self-organized architectures [2]. Original physical properties in these host-guest materials are related to their aperiodic feature which, unambiguously, appears in their superspace diffraction pattern [3,4]. Here, we will present a first evidence of a superspace symmetry breaking involving only the internal variable of the superspace in these materials. These observations force a total reconsideration of the interactions in these self-organized compounds.

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Keywords: aperiodic materials, supramolecular assemblies, structural phase transitions

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Structural Study of Single Crystalline i-Zn-Mg-Dy at high Pressure and high Temperature

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In order to understand the origin of the structural stability of quasicrystals, it is important to investigate the pressure and temperature dependence of their structures. Quasicrystalline phases in the Zn-Mg-R (R = rare-earth and Y) alloys are classified as the Frank-Kasper type. Both the icosahedral and decagonal phases have been obtained in the alloys, which are thermodynamically stable at ambient conditions and reveal a high structural perfection [1]. The icosahedral Zn-Mg-Y quasicrystal is found to be stable at high pressures up to 70GPa at room temperature [2]. The hardness seems to be primarily governed by the complexity of the structure and the bonding strength. At room temperature, Zn-Mg-R quasicrystals exhibit a strong indentation size effect with the hardness increasing with decreasing load. This effect becomes inverted at higher temperatures [3]. Therefore it is interesting to perform structural studies at HP/HT.

We will report on the results of an in-situ single crystal x-ray diffraction study on i-Zn-Mg-Dy up to ca 12GPa and 873K using a heatable diamond anvil cell. The icosahedral quasicrystal is found to be essentially stable within the experimental framework.

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Framework Structures for Quasicrystal Models based on Dense Icosahedral Sphere Packings

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Dense icosahedral sphere packings (DISP's) are known to be obtained by placing spheres on subset vertices of three-dimensional Penrose tiling (3DPT) which are called the twelve-fold packing sites [1]. The DISP's give the best known quasiperiodic cluster packings with *b*- and *c*-links along their twofold and threefold directions, respectively (b=2.75a and c=2.38a, where a is the edge length of the 3DPT). However the shapes of the possible interstices are unknown.

Instead of spheres, we consider to place rhombic triacontahedra (RT's), having an edge length of a, on the sites. As a result, the RT's share a rhombus face and an obtuse rhombohedron with *b*-link and *c*-link, respectively. These framework structures are well described by the section method in six-dimension, once occupation domains for the DISP's are specified. It is shown that the interstices can be described by acute and obtuse rhombohedra. Application of the present framework structures to p-type icosahedral quasicrystals is discussed.

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