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.

[1] Henley C. L., Phys. Rev. B, 1986, 34, 797.

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