

MS21-05 Structural Characteristics of Complex Intermetallics. Julia Dshemuchadse, Walter Steurer, *Laboratory of Crystallography, ETH Zurich, Switzerland*
E-mail: julia.dshemuchadse@mat.ethz.ch

Complex compounds can be found in a large variety of intermetallic systems. They are usually categorised according to the number of atoms per unit cell, which amounts to hundreds or even thousands in some cases [1]. Several quasicrystal approximants and some modulated structures can be found among these compounds, which occur preferably in highly-symmetric lattices. Therefore we are concentrating on cubic [2] and hexagonal structures.

In order to better understand complex intermetallics, we describe their structures in different ways, for example in terms of the cluster approach, as superstructures, or as layered compounds. When these compounds are interpreted as cluster packings, two recurring structural motifs are most prominent: multiple-shell fullerene-like clusters packed closely in different ways and blocks of smaller polyhedra (mainly Friauf polyhedra and similar clusters) filling the remaining gaps. Another general property of complex intermetallics is a complex diffraction pattern, which contains a small subset of strong reflections, indicating that the structure can be regarded as a superstructure. The periodicity of the underlying basic structure corresponds also to the number of flat and puckered layers, which can be regarded as building the structure by simple stacking.

By comparing geometrically similar but chemically different structures, we hope to reveal the building principles responsible for the formation of highly complex intermetallic structures. In order to do this, we juxtapose the mentioned complementary methods of structure description.

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MS22-01 Structural and Magnetic Ordering in Cd-based Crystalline Approximants. R. Tamura,^{ab} and C. P. Gomez,^b
^a*Dept. of Mater. Sci. & Tech., Tokyo University of Science, Japan,* ^b*Angstrom Laboratory, Uppsala University, Sweden*
E-mail: tamura@rs.noda.tus.ac.jp

Since the discovery of quasicrystals (QCs) by Shechtman *et al.*[1] particular attentions have been paid to their unique atomic structure as well as their intrinsic physical properties. Amongst all the icosahedral (*i*) QCs, substantial works have been done on stable ternary *i*-QCs such as *i*-Al-Cu-Fe and *i*-Al-Pd-Mn QCs because of their high structural perfection. The discovery of stable binary *i*-Cd-Yb and *i*-Cd-Ca QCs by Tsai *et al.*[2] has opened up a new era for the quasicrystal researches since these *i*-QCs and approximants (APs) are not only structurally ordered but also chemically ordered. Subsequent works have shown an occurrence of a unique low-temperature structural transition associated with the dynamical motion of a tetrahedron inside an icosahedral cluster in a series of Cd₆M APs[3], which is classified into a “nondiffusive order-disorder transition”. In addition to the unique structural transitions, the Cd₆M APs are also found to exhibit long-range magnetic orders [4] at low temperatures unlike ternary magnetic *i*-QCs and APs where spin-glass-like freezing has been observed without exception. In this talk, we first describe the high- and low-temperature crystalline structure of the Cd₆Tb AP as a typical example and then describe its structural and magnetic transitions in detail.

- [1] Shechtman *et al.*, *Phys. Rev. Lett.* **53**, 1951 (1984).
- [2] Tsai *et al.*, *Nature* **408**, 537 (2000).
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