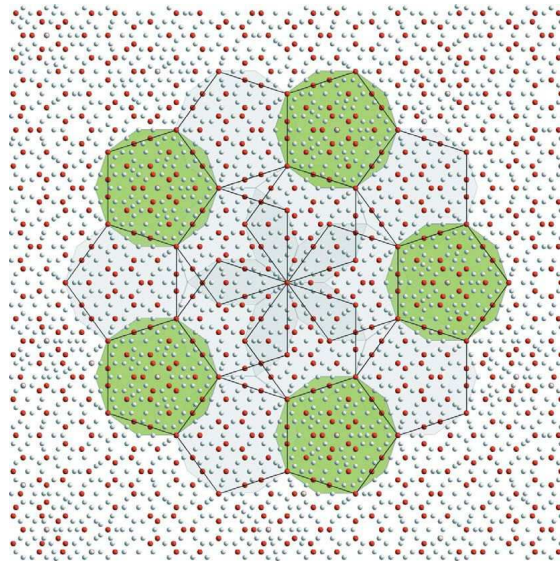


Aperiodic „quasi“- crystals and their electronic structure

Karsten Horn

Fritz Haber Institute of the Max Planck Society, Berlin, Germany

Dan Shechtman's discovery in 1982, of compounds (“quasicrystals”) whose atoms are packed in an ordered pattern that shows no translational symmetry, initially caused much controversy. However, his correct interpretation of electron micrographs in terms of aperiodic order, rewarded by the Nobel Prize in Chemistry in 2011, eventually forced scientists to reconsider their concept of the very nature of solid matter, and made the International Union of Crystallography change their definition of what constitutes a crystal. Since translational symmetry is lacking, familiar concepts in solid state physics such as Bloch’s theorem and Brillouin zones had to be reconsidered and adapted. There are by now hundreds of alloys which exhibit quasiperiodic ordering in some region of their phase diagram, and they exhibit quite unusual physical properties. While a good understanding of the structural properties of quasicrystals and their atomic arrangement has been achieved, the driving force for the formation of these strange solids is still the subject of intense theoretical and experimental work, and the knowledge of their electronic structure is important in this context. In the talk I will give a brief introduction on aperiodic ordering and the properties of quasicrystals, and discuss the use of photoelectron spectroscopy to elucidate the nature of electronic states in quasicrystalline alloys such as Al-Ni-Co, Al-Cu-Co, Al-Pd-Mn etc. . While angle-resolved spectroscopy is of prime importance in this context, recent hard x-ray excited angle-integrated photoemission work to study the nature of the pseudogap will also be discussed.



Model of the atomic order of a section perpendicular to the decagonal axis of decagonal Al-Co-Ni
S. Deloudi, W. Steurer *Phil. Mag.* **87**, 2727(2007)