Anisotropic Transport Properties of Decagonal Quasicrystals and Their Periodic Approximants

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Crystallographic structures of decagonal quasicrystals (*d*-QCs) are described as a periodic stacking of atomic planes with quasiperiodic in-plane atomic order. The stacked-layer structures are observed also in the periodic decagonal approximant phases. In this talk, we consider the anisotropy in the physical properties in the *d*-QCs and their periodic approximants on the basis of the measurements of the transport coefficients (electrical resistivity, thermopower, and Hall coefficient and thermal conductivity). By comparing the anisotropic transport coefficients along the stacking- and the in-plane directions of a series of decagonal approximants with different number of atomic layers within one periodicity unit; (the two-layer Y-Al-Co-Ni [1]; the four-layer o-$Al_{13}Co_4$ [2] , $Al_{13}Fe_4$ and $Al_{13}(Fe,Ni)_4$ [3]; the six-layer $Al_4(Cr,Fe)$[4] and T-$Al_3(Mn,Fe)$)[5] with that of a two-layer *d*-Al-Co-Ni decagonal quasicrystal[6-8], we show the universality that the stacking direction perpendicular to the atomic planes is always the most conducting one for both the electricity and heat, along the stacking direction, whereas the in-plane anisotropy is considerably smaller or negligible.[5,7-8]

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