low temperatures [4].

In the present work, we have prepared Cd_6R single grains by a self-flux method and have measured their physical properties such as electrical, thermal and magnetic properties. We have also performed high-magnetic field measurements up to ~50 Tesla at low temperatures down to 1.3 K.

For most of Cd_6R compounds, the magnetic susceptibility is found to obey the Curie-Weiss law, say, above 50 K, indicating that R atoms at the vertices of the R_{12} icosahedron are well localized in a trivalent state. At low temperatures, heat capacity exhibits peaks attributed to occurrences of long-range magnetic orders. In Cd_6Tb, measurements under high-magnetic field show two clearly meta-magnetic transitions below 10 Tesla. This result suggests that several magnetic states are nearly degenerate at low temperatures. Detail of the physical properties of Cd_6R will be discussed in the presentation.

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Synthesis of single-grained $Zn_{88}Sc_{12}$ quasicrystal and its electrical resistivity

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$Zn_{88}Sc_{12}$ icosahedral qusicrystal (iQC) has recently been discovered by Canfield et al.[1] It is a stable binary iQC and is expected to contain no chemical disorder. An interesting feature about the iQC is that two different shapes, i.e., morphologies, of single grains are obtained depending on the initial composition, the reason of which has not been understood[1]. In this study, we have prepared $Zn_{88}Sc_{12}$ single grains and investigated the electrical properties of the $Zn_{88}Sc_{12}$ single grains having two different morphologies.

Single-grained $Zn_{88}Sc_{12}$ quaicrystals were prepared using a self-flux method. Pure elements of Zn(6N) and Sc(3N) with initial compositions of $Zn_{100-X}Sc_X$ with X in the range between 1.5 and 4 were placed in an alumina crucible, sealed inside a quartz tube under argon atmosphere. The elements were melted at 860° C for 3h, and slowly cooled to 490〜500 ° C . Then, single grains were separated from the melt using a centrifuge. The obtained grains are found to exhibit two types of growth morphologies as reported[1] depending on the initial composition; PD(Pentagonal Dodecahedron)-shaped grains were obtained for the initial compositions of $Zn_{96}Sc_4$, $Zn_{97}Sc_3$, $Zn_{97.5}Sc_{1.5}$, while RT(Rhombic Triacontahedron)-shaped grains were obtained for the initial compositions of $Zn_{98}Sc_2$ and $Zn_{98.5}Sc_{1.5}$.

Temperature dependences of the electrical resistivity ρ(T) are found to be almost the same for all the grains, exhibiting a negative temperature coefficient, which is a typical behavior of ternary iQCs. We note that the PD-shaped grains exhibit slightly higher values of the resistivity ratio ρ_{16K}/ρ_{290K} than the RT-shaped grains. In the presentation, the results on annealed grains will be also discussed.

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Dislocation mobility in icosahedral quasicrystals

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A theoretical description of the dislocation motion in quasicrystals is developed. The hydrodynamic approximation is used in deriving the expression for dissipation losses of a moving dislocation. The continuum theory of dislocation mobility [1] and the dynamic equations of elastic and phason fields [2] are combined. Hence the dependence of dislocation mobility on vacancy concentration is found explicitly [3,4]. The numerical analysis of dislocation mobility shows that phason deformations make the major contribution to the drag of free dislocations in icosahedral quasicrysal Al-Pd-Mn. The influence of vacancies on dislocation mobility becomes noticeable only at very large vacancy concentration, $C_v > 10^{-3}$, and at very low dislocation velocity, $v_D < 10^{-8}$ cm/s.

The study of existing experimental data reveals the considerable contribution of mutual pinning of dislocations to their mobility in icosahedral quasicrystal. The expressions obtained for dislocation mobility are valid for temperatures close to the melting temperature since the role of mutual pinning decreases with the increase of temperature. Dislocation drag on pinning centers has a dominant role at lower temperatures.

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Structural characterization of thin AlPdRe quisicristalline film formation during annealing process

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One of the possible ways to form ultrathin $Al_{70}Pd_{20}Re_{10}$ quasicristalline film is the annealing of 3-layer (Al/Pd/Re) structure. Layer-by-layer ion-plasma deposition allows forming thin quasicrystalline film with precisely controlled thickness and homogeneity. Deposition was performed in a vacuum system with a sputtering chamber in the form of a Penning cell by Kr assisted magnetron sputtering from separate pure materials targets. After deposition of a layered structure, the films were coated with a layer of aluminum oxide, which was formed by sputtering of aluminum in a krypton atmosphere with addition of oxygen. The aluminum oxide layer was deposited to prevent selective escape of elements from the film upon vacuum annealing. The concentration range for the films prepared coincided with the known range of quasicrystalline phase formation in bulk samples [1].

We have studied phase evaluation of Al/Pd/Re layered structures in-situ during heat treatment and layer intermixing on intermediate annealing steps ex-situ. In-situ phase evolution study was done with X-ray diffraction and ex-situ layers intermixing analysis was done with

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