PS11.04.15 MICROSCOPIC, ETCHING AND X-RAY STUDIES ON DOPED CdI_2 DENDRITIC SINGLE CRYSTALS. G.C. Trigunayat and Binay Kumar, Department of Physics & Astrophysics, University of Delhi, Delhi-110007

Dendritic single crystals of cadmium iodide are grown by vapour method, both without doping and with PbI_2 and $CdBr_2$ doping. They are examined for their polytypism by x-ray diffraction. The undoped crystals exclusively exhibit the basic polytype 4H, with small degree of arcing, but with no streaking existing on their oscillation photographs. In contrast, the oscillation photographs of doped crystals reveal frequent presence of higher polytypes, particularly the 12-layered rhombohedral one. The arcing and streaking of the reflections on the oscillation photographs undergo a marked change with the change of nature and amount of doping.

The basal surfaces of the as-grown doped and undoped crystals are examined by optical and scanning electron microscopy. A wide variety of growth features are observed, viz. growth steps inclined at 120°, bunching of steps, overgrowths, along with typical dendritic features.

The basal surfaces of the crystals are also subjected to etching, which is carried out by controlled condensation of water vapour on the surface. Hexagonal etch pits are observed in the case of undoped crystals while for the doped crystals both hexagonal and triangular pits are observed. The relative number of the hexagonal and triangular pits are found to depend on the extent of doping. The results have been analysed to provide useful information regarding the mode of crystal growth and defect content in the crystal and regarding the formation of polytypes.

PR11.04.16 INFLUENCE OF DEFECT STRUCTURE ON THE $\alpha \rightarrow \beta$ TRANSFORMATION KINETICS IN Pd - H SYSTEMS. M.A.Knyazeva, A.A.Katsnelson, A.I.Olemskoi, G.P.Revkevich, Physics Department, Moscow State University, Russia

It was shown in [1] that the rate of the beta phase nucleation was determined by the energy of the defect structure E and by the maximum potential barrier U. Large spectrum of E and U was realized in the different defect structures which were obtained in specimens subjected to several hydrogenation-degassing cycles. The kinetics of the $\alpha \rightarrow \beta$ transformation in deformed and annealed palladium specimens was studied by X- ray diffraction.

It was found that at the hydrogenation the β phase content p increased with the increasing of the cycle number n up to 60 % in deformed specimen. The dependence p(n) had another behavior: $p(1) = 50\%$, $p(2) = 20\%$, $p(3) = 28\%$, $p(4) = 22\%$ for the annealed specimen.

Comparison of the intensities of the first and second-order diffraction maximums shown that vacancy coagulation took place, so the defect density and the energy of the defect structure E decreased in the deformed specimen. As a result the p content increased monotonously with the increasing n.

High dislocation density (randomly distributed and in the walls) was generated in the annealed specimen at the end of the first cycle. That led to the increasing of E_d and U, respectively. The β phase content become 2.5 times smaller after the second hydrogenation. The defect density (point and linear) changed unmonotonously at the next cycles that determined the type of E_d changes. These factors caused unregular character of p changes in II-IY cycles. It may be suggested that the intensive increase of U and unmonotonous changes of E_d are connected with unhomogeneous defect distribution in the annealed specimen, which differs the last specimen from deformed one.

1. Revkevich G.P., Katnelson A.A., Olemskoi A.I., Knyazeva M.A. Vestn.Mosc.Univ., Fiz.,033,N2 (1992) 74.

PR11.04.17 MOSSBAUER AND X-RAY INVESTIGATIONS OF THE KINETICS AND MECHANISM OF M-TYPE BARIUM HEXAFERRITE FORMATION FROM HYDROXIDE-CARBONATE PRECIPITATES. V.A. Yelshanskii, A.G.Belous, Y.V. Pashkova, Department of Electrophysical Materials, Institute of General and Inorganic Chemistry, Kiev, Ukraine.

The kinetics and mechanism of M-type barium hexaferrite (BHF) formation during the thermal treatment of hydroxide-carbonate precipitates obtained by the coprecipitation and consecutive precipitation of slightly soluble compounds of iron (III) and barium from aqueous solutions of their salts have been studied.

It has been found that BHF formation involves no intermediate phase by Ba^{2+} diffusion into the rhombohedral α-Fe_2O_3 lattice, this lattice being rearranged into a hexagonal one.

A method for separating the coexisting phases (α-Fe_2O_3 and BHF) when studying BHF formation processes by Mossbauer spectroscopy has been developed.

The method for precipitating the components in this system has been shown to greatly influence the formation of both crystal and magnetic structure (the distribution of Fe^{3+} cations over the crystal-chemical positions of the BHF structure).

Phase Transitions

PS11.05.01 PRECURSOR FLUCTUATIONS OF MARTENSITIC PHASE TRANSITION ON METALLIC SODIUM. H. Abe[1], R. J. Matsuo[1], K. Ohshima[1], M. Imai[2] and K. Kakurai[2], Department of Materials Science and Engineering, National Defense Academy, Yokosuka 239, [1]Institute of Applied Physics, University of Tsukuba, Tsukuba 305, [2]Institute for Solid State Physics, University of Tokyo, Tokyo 106, Japan

Nucleation and growth process of the first-order phase transition has been studied for a long time. In particular, the nucleation problem of the martensitic phase transition has also been discussed recently. In fact, critical size was estimated as about 15 Å by Kakeshita model: once local fluctuation is over critical size, nucleation occurs. On the other hand, we have already found the incubation time for metallic sodium and In-Tl alloys, where incubation time is a waiting time until the phase transition starts at fixed temperature. Moreover, it is found that this incubation time is originated from the dynamic nucleation process during the non-equilibrium state. Therefore, small angle neutron scattering (SANS-U at JRR-3M) was performed with using metallic sodium single crystals in order to determine its critical size. Metallic sodium is regarded as the best material to study nucleation process, since it has no composition fluctuations which complicates nucleation problem. In addition, Si single crystal windows attached on Al sample container enable it to suppress the background. As the result, we obtain local fluctuation size during 12 hours incubation time. Precursor local fluctuation size found to be about 30 Å. Peak around large q region shows some correlation between each fluctuation due to elastic anisotropy.