07.2–9 A CORRELATION OF THE STRUCTURES OF TIN IN THIN FILMS AND IN LIQUID STATE. S.K.Peneva,K.D.Djuneva and D.D.Nihtianova, University of Sofia,Chem.Fac.,Dep.Phys.Chemistry,1,Anton Ivanov Rd.,Sofia 1126,Bulgaria.

The first near neighbours interatomic distances is observed by RHEED long-range ordered structures-LROS,of α-Sn,and of β-Sn thin tin films-TTF,grown from vapours-Peneva,Djuneva,to appear in TSF,(isomeric shifts of the Mössbauer spectra +2.2(or +2.8)$\pm$0.2mm/s,respectively, refered to a SnO_2 source),correspond to the distances of closest approach-DCA,in molten Sn β-Sn DCA-3.27 Å,Furukawa et al.Phil.Mag.,8 (1963)141;3.17 Å-Batalin et al.Kristallograph. 15(1970)850;3.14 Å-Krebs et al.Z.Naturforsch. 23a(1968)491; α-Sn DCA-2.80 Å-Furukawa et al. The stable first near neighbours chemical bondings observed in the α-Sn,and in the β-Sn TTF after their heating above the melting point of tin,and the great disorder in the higher coordination spheres of both types,resulting in incommensurate LROS formations,suggest that not only α-Sn,but also β-Sn is existing as clusters in the melt.Therefore,the structure of the various TTF is to be correlated not only with the tin aggregates coming from the vapour but also on the type of Sn clusters in the melt.There are experiments on TTF vapour grouth-Djuneva,Peneva,TSF,67(1980)371, showing DCA=2.40 Å in the freshly grown films Such films consist of tin with a lattice identical to that of Si, α_2-Sn,and is with δ=+4.4 $\pm$0.2mm/s.Heating of α-Sn, β-Sn,and α_2-Sn TTF above the melting point of Sn leads of appearance of Sn structures with δ>+4.4 mm/s,and with expected DCA<2.40 Å.Such tin structures are expected,Bonchev et al.KINAM,3(1981)389, to have d electrons participating in their chemical bondings-Sn(d).The growth conditions of Sn(d) structures suggest a possibility of Sn(d) clusters in the molten tin.Sn(d) structures are not so uncommon.Rusanov et al.,to appear in J.S.S.Chem.,has found α_2-Sn after quick reduction of $SnCl_2$ with Mg,better in a magnetic field.Sn(d) states were observed among the oxides grown on quickly cooled in vacuum TTF and massive Sn ,and among the oxides obtained by chemical vapour deposition of tin oxides-Peneva et al.Abstracts ICCG-6,Moscow, 1980,Vol.IV,pp.253,417,and TSF under publication.The oxides were derivatives mainly of α_2-Sn.

07.2–10 THE CHARACTERIZATION OF ELECTRONIC CRYSTALS BY X-RAY MULTIPLE DIFFRACTION. B R Brown and B J Isherwood, GEC Research Laboratories, Hirst Research Centre, Wembley, UK.

X-ray multiple diffraction techniques have been developed to provide, on a routine, non-destructive, basis, information on the symmetry, lattice parameters and distortions in bulk and heteroepitaxial single crystals. The instrumentation and procedures used to record and interpret the XMD patterns will be described and illustrated by application to the study of $K(D,H)_2PO_4$ crystals, bulk and epitaxial garnets, and heteroepitaxial III-V structures. The latter will include results from a current study to determine the thermal expansion of III-V crystals at elevated temperatures (~700°C).

07.2–11 DIRECT OBSERVATION OF ANISOTROPIC SURFACE STRUCTURE OF Pd/Nb THIN FILMS USING X-RAY SURFACE SPECULAR REFLECTION. By S.L. Chang L.P. Cardoso and S. Moehlecke, Instituto de Física, UNICAMP, Campinas, SP, 13100, BRASIL.

A Novel method of detecting anisotropic surface structure of thin films is developed, utilizing surface specular reflection of X-ray white radiation. This method is applied to structural studies of Pd/Nb surfaces, where the preferential orientations for Pd and Nb are [111] and [110] respectively.
It has been suspected that the surfaces of Pd/Nb and other related metal systems may have anisotropic structure, although the investigation of using high-resolution optical microscope, scanning electron microscope and conventional X-ray techniques, like the powder method, shows isotropy for images and for θ-2θ scan. With the newly developed method, we are able to observe the anisotropic feature of the surface of this material. The surface reflected images of the thin films obtained at the position, where the incident beam is parallel to the direction of motion of the sample during crystal growth, show several vertical bands. While these reflection bands disappear, when the sample is subject to a 90° rotation around its surface normal. The same results are repeatedly observed for this material with absorbed hydrogen. The origin of this structural anisotropy and its relation to hydrogen uptaking may be due to the anisotropic strain in the interface.

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