

07.8-02 STRUCTURES, CONDUCTIVITIES AND PHASE TRANSITIONS OF SUBSTITUTED MORPHOLINIUM TCNQ-COMPLEXES. By R.J.J. Visser, T.W.L. van Heemstra and J.L. de Boer, Laboratory for Chemical Physics, Rijksuniversiteit Groningen, Nijenborgh 16, 9747 AG Groningen, The Netherlands.

Morpholinium derivatives form a wealth of complexes with TCNQ. Even with simple substituents (R = H, methyl or ethyl) we found, at room temperature, the existence of 17 different TCNQ crystal structures, some of which are already described by Van Bodegom et al. 1981, Acta Cryst. B37, 107, 114, 119. Most, but not all, of these structures belong either to the 1:1 or the 1:2 class; several of them show phase-transitions, above or below room temperature. In general, the compounds are semi-conducting, but there is a wide range (6 orders of magnitude) in electrical conductivity at room temperature.

Also morpholinium-derivatives with larger substituents (R = propyl, butyl etc) give complexes with TCNQ. The same holds for several derivatives of thiomorpholinium instead of morpholinium itself. In this way, an additional 30 new solids have been prepared. Again, many of them are semi-conducting and some show phase-transitions.

Temperature dependent conductivity-data will be shown and relations will be indicated between physical properties and crystal structures.

07.9-01 RARE-EARTH ALUMINATES FOR INFRA-RED LASER APPLICATIONS. By A. Kahn, A.M. Lejus, J. Théry and D. Vivien, E.N.S.C.P., Chimie Appliquée de l'Etat Solide, Paris, France.

Large sized single crystals of several rare earth aluminates with the general formulae $\text{Ln}_{1-x}\text{Nd}_x\text{MAl}_{11}\text{O}_{19}$ ($\text{Ln}^{3+} = \text{La, Nd, Sm, Eu}$ $\text{M}^{2+} = \text{Mg}$) have been synthesized by the flame fusion method. A full refinement of the quasi magnetoplumbite structure has been performed on the pure lanthanum compound ($x = 0$, $\text{M} = \text{Mg}$) Intensities from a single crystal have been collected on a semiautomatic diffractometer using MoK α radiation. Final R value was 0.039. Additional results on local symmetry have been obtained from EPR and magnetic investigations of mixed La,Nd aluminates where Nd was the magnetic probe. Spectroscopic studies of this La-Nd series of compounds have revealed that the fluorescence yield of Nd^{3+} in the magnetoplumbite host lattice could allow the further utilization of these materials as high power infrared lasers. The maximum lifetime of the excited state is found for the composition $\text{La}_{0.9}\text{Nd}_{0.1}\text{MgAl}_{11}\text{O}_{19}$ ($x = 0.1$).

07.9-02 UNUSUAL LATTICE PARAMETERS OBSERVED ON ANNEALING RAPIDLY SOLIDIFIED ALSi-ALLOYS. By E.J. Mittemeijer, P. van Mourik and Th.H. de Keijser, Laboratory of Metallurgy, Delft University of Technology, Rotterdamseweg 137, 2628 AL Delft, The Netherlands.

During precipitation in melt-spun AlSi-alloys the lattice parameter of the Al-rich phase was measured at room temperature as a function of silicon content and annealing time and temperature. Some striking effects were observed: (i) At the ageing temperatures applied the solubility of Si in Al is negligible. However, the lattice parameter observed after completed precipitation always *exceeded* that of pure Al (Si lowers the lattice parameter of Al). This can only be explained by a macrostrain due to the difference in thermal expansion between the Al-rich and Si-rich phases (as a result of cooling from ageing to room temperature). The effect can be described quantitatively by adopting the theory of Eshelby [Solid St. Phys. 3(1956)79] for this case of the elastic distortion of a matrix (Al-rich) by small misfitting inclusions (Si-rich). (ii) After a short time of ageing at a "low" temperature (397 K) a maximum was observed in the lattice parameter of the Al-rich phase. This effect may be due to the condensation/annihilation of excess vacancies originating from quenching. (iii) During ageing at a "high" temperature (448 K) a maximum in the Al-rich phase lattice parameter was observed too, but at a larger (!) ageing time than in case (ii) and therefore this effect has another origin. It may be interpreted in terms of lattice strains induced by precipitation (a Si-atom in its own diamond-type lattice occupies a volume 23% larger than in the f.c.c. lattice of Al), which cannot be caught up by the recovery process at this temperature, in contrast with the "low" ageing temperature where this maximum was not observed.

07.9-03 X-RAY DIFFRACTION ANALYSIS OF THE NON-UNIFORM MICROSTRUCTURE OF RAPIDLY SOLIDIFIED ALSi ALLOYS. By R. Delhez, Th.H. de Keijser, E.J. Mittemeijer, P. van Mourik and N.M. van der Pers, Laboratory of Metallurgy, Delft University of Technology, Rotterdamseweg 137, 2628 AL Delft, The Netherlands.

Ribbons of AlSi alloys were prepared by ejecting a stream of molten alloy onto the cylindrical surface of a rotating wheel (maximum ribbon thickness 150 μm ; cooling rate of $\sim 10^6\text{Ks}^{-1}$). An Al(-rich) and a Si(-rich) phase were present.

Until now no size-strain and texture analysis of the wheel (chill) and upper side of melt-spun ribbons were performed as a function of alloy composition and velocity of the wheel.

Size-strain analysis. X-ray diffraction line broadening from both phases was larger for the wheel side than for the upper side and increased with increasing velocity of the wheel. The broadening from the Si phase was much larger than from the Al phase. The Al phase showed a dominant strain broadening. The Si phase showed both size and strain broadening with the smallest crystallite size and the largest strain at the wheel side.

Texture analysis. The Si phase did not show a preferred orientation. With reference to the surface and the axis of a ribbon, the texture of the Al phase is described by $\{110\} \langle 100 \rangle$ at the wheel side and by $\{100\} \langle 110 \rangle$ at the upper side. The sharpness of both textures decreases with increasing silicon content and increasing velocity of the wheel.

The wheel side of the ribbons is thought to have experienced a larger cooling rate than the upper side. This may explain (i) the above mentioned differences between wheel and upper side and (ii) the observation of a thin, fine-grained region at the wheel side changing into a region of columnar grains.