relaxation behaviour of the scattering phenomenon have been studied in detail.

α-lithium iodate is a quasi 1-dimensional ionic conductor whose carriers are interstitial Li ions and Li vacancies (Zhang An-dung *et al.*, Acta Physica Sinica (1980) **29**, 1158). The local deformation of the crystal takes place when the carriers are migrating under the action of a dc field. The fluctuations of the strain in the crystal cause fluctuations of the optical axis. The thermal average values of the dielectric tensor element ε_{xz} and ε_{yz} are non-zero and have spatially periodic distribution (caused by defects). Therefore, the abnormal scattering of light will be produced (P. G. de Gennes, The Physics of Liquid Crystals, sec. 3.4).

oxygen in the spinel-block and the occupation of the crystallographic site varies from 0.17 at low temperature to 0.10 at 620K.

Other hydrogens are strongly delocalized in the conduction region, forming long (O-H)-lengths (1.73 Å) ; no definite evidence of the existence of an H_3O^+ entity has been found during this structural study. At the higher temperature, there are less hydrogen atoms and their thermal vibration amplitudes are large, so that it becomes more difficult to locate them precisely. However, some of these hydrogens seem to be distributed around the oxygen which links the spinel-blocks together.

These results emphasize the possibility that the delocalized hydrogens participate in the conduction mechanism.

07.3-04 TEMPERATURE DEPENDENCE OF THE HYDRATED HYDROGEN β''-ALUMINA STRUCTURE BY NEUTRON DIFFRACTION STUDY.

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Following previous conductivity measurements, quasielastic neutron scattering and thermal gravimetric analysis on hydrated hydrogen β''-alumina, a neutron diffraction study on a single crystal has been undertaken. The interesting physical properties of this compound called for a precise structure analysis. Hydrated hydrogen β''-Alumina exhibits a protonic conduction (10^{-5}ohm^{-1}cm^{-1} at room temperature) much higher than that of the β-phase (10^{-11}ohm^{-1}cm^{-1}) (G.C. Farrington and J.L. Briant, Fast Ion Transport in Solids, North Holland, New York, 1979), and the composition is relatively stable up to about 500K. Quasielastic neutron scattering has confirmed these results. To obtain further details of the location and number of the protons, neutron diffraction data for hydrated hydrogen β''-alumina were collected at three temperatures : 110K, 300K and 620K.

The compound is rhombohedral, space group $R\bar{3}m$, and the lattice parameters in the hexagonal unit cell are :
T = 110K ; a = 5.625(4) Å ; c = 34.182(36) Å
T = 300K ; a = 5.626(8) Å ; c = 34.234(34) Å
T = 620K ; a = 5.630(13)Å ; c = 33.852(47) Å

Thermal gravimetric analysis shows that approximately 64% of H_2O is weakly bound and desorbed at 580K (W.L. Roth, M. Anne, D. Tranqui and A. Heidemann, Fast Ion Transport in Solids, North Holland, New York, 1979) ; this is consistent with the important decrease of the c-parameter between room and high temperature.

At low temperature, the composition found by neutron diffraction is $1.64H_2O$-$0.49MgO$-$5.18Al_2O_3$ per spinel-block.

Essentially, one hydrogen atom is covalently bonded to an

07.3-05 NEUTRON AND X-RAY STUDIES FOR $Na^+\beta''$ ALUMINA STABILIZED WITH Mg^{2+} OR WITH Mg^{2+}-Li^+.

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Measurements of conductivity versus temperature for $Na^+\beta''$ alumina stabilized with Mg^{2+} or with mixed Mg^{2+}-Li^+ have shown significant difference between the two compounds : The Ln(σT) plot for the mixed compound consists of two straight lines with activation energies of 0.16 eV below 135°C and 0.10 eV above this temperature whereas that of the Mg^{2+} stabilized is nearly constant (0.32 eV) below 135°C and decreases smoothly to reach ∿ 0.10 eV at 390°C. It has also been observed that the conductivity of the mixed phase is slightly higher than that of the Mg^{2+} phase, at least in the low temperature range.

Mg^{2+} and Mg^{2+}-Li^+ stabilized $Na^+\beta''$ alumina are rhombohedral, space group $R\bar{3}m$ with the following a and c hexagonal unit cell parameters :
a = 5.625 Å ; c = 33.601 Å for Mg^{2+}, $Na^+\beta''$ alumina
a = 5.616 Å ; c = 33.726 Å for Mg^{2+}-Li^+, $Na^+\beta''$ alumina.
Both X-Ray and neutron diffraction data at room temperature indicated that the average bond length Al-O of the tetrahedral site Al(2) in the spinel block is significantly longer (1.849 Å) than that in the Mg^{2+}-Li^+ stabilized phase (1.839 Å) suggesting that the Al(2) site occupancy (by Al^{3+}, Mg^{2+} and Li^+) has been modified by Li^+ insertion. However the lithium positions are still unkown. Further neutron data refinements are underway in order to determine their location.

On the other hand the Na^+ concentration in the conduction plane is much higher (0.34) in the Mg^{2+}-Li^+ compound than in the Mg^{2+} compound (0.28).

Thermal expansion measurements of unit cell constants from room temperature to 450°C have shown a strikingly different behaviour between the two compounds : all para-