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SPACE GROUP AND UNIT CELL DIMENSIONS OF COMPLEX SILVER LUTIDINE NITRATE

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(*Received January* 24, 1967).

Complex silver lutidine nitrate crystals are obtained by slow evaporation from an aqueous solution of the substance in acetone.

The crystals belong to the orthorhombic system. The unit cell dimensions are obtained from rotation and Weissenberg photographs along [001]. The dimensions of the unit cell are as follows :

$$a = 13.39\text{Å}, \quad b = 16.93\text{Å}, \quad c = 6.88\text{Å}$$

zero and first layer Weissenberg photographs along [001] were taken and the following systematic extinction were obtained.

hoo—even present; *oko* —even present; *ool*—even present; *hko*—no condition; *okl*—k+1 even *hol*—h even

From the above conditions the space group is assigned as $P_{na}21$

The density was determined by flotation method and was found to be 1.564gm/cc

The density calculated by considering 4 molecules per unit cell is 1.636gm/cc.

Further work on the determination of the complete structure of the substance is in progress.

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A THEORY OF CLASSICAL LIQUIDS

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(*Received January 11*, 1968)

In case of liquid the configuration changes continuously with time. Taking the time average of these different configurations, we would plot the average

number of nuclei as a function of the distance from the atom at the origin. We would now get a continuous curve with peaks at different distances, the heights of these peaks decreasing as the distance from the atom at the origin increases. After some distance this curve fails to show any structure. With rise of temperature the heights of these peaks and the number of distinct peaks decrease.

The continuous curve with peaks and flat regions in case of liquids can be explained by the assumption that a liquid consists of a large number of randomly oriented crystals of submicroscopic size, each containing quite a few atoms, and are connected with each other by layers of a wholly amorphous phase. The Submicroscopic crystals, again are formed and are broken down within a short time giving rise to new crystals which again break down and so on. These groups are named by Stewart (1930, 1931) as "cybotactic groups" (or regions).

It is of interest to note that the average number of nearest neighbours of the atom at the origin is approximately same as it is in the solid. So this atom in the above plot will vibrate as in a solid. Since this atom is chosen at random, we conclude that all the atoms in a liquid will vibrate and for simplicity we may assume that the amplitude of vibration of the atoms in the liquid state is constant and is the same as the amplitude at the melting point.

In addition to this vibration the atoms in the amorphous phase may have the motion of translation like the atoms in a perfect gas. To find the number of such atoms, we will assume after Silverman (1933) that the groups or clusters break down due to the impact of the simple atoms in the amorphous phase. When these simple atoms collided against a cluster, some of them are captured in the cluster and some atoms from the cluster are thrown out. Thus the old ones breaks down giving rise to new ones, We may take the possibility of emission to be proportional to the possibility of capture.

$\pi\lambda^2$ is the area of cross section of the incoming atom, where λ is the wavelength associated with it. If v is its velocity then $\pi\lambda^2 v$ is the volume of the cylinder sewpt by the atom in unit time. If n is the number density, then $\pi\lambda^2 vn$ is the number of encounters with this atom in unit time. Thus the possibility of capture and hence the possibility of emission may be taken to be proportional to the number of such encounters. The number density n can be taken as $Lf(v)$ where L is the total number of atoms present in the total volume V of which $f(V)$ is a function. Since $\lambda \propto \frac{1}{v}$ and $v \propto T^{\frac{1}{2}}$, the possibility of emission may be given by $\theta T^{-\frac{1}{2}}$ where θ is a constant.

Thus the number of atoms emitted by the clusters may be given by $\theta T^{-\frac{1}{2}} N$ where N is the number of atoms in the clusters. When temperature rises, this measures the temperature rate of decrease of the number of atoms in the clusters at the temperature. So we write

$$dN = -\theta T^{-\frac{1}{2}} N dT$$

from this we get

$$N = Le^{-2\theta}(T^{\frac{1}{2}} - T_m^{\frac{1}{2}})$$

imposing the condition that at temperature T_m the solidification point all the L atoms lose the motion of translation i.e. at $T = T_m$, $N = L$. So the number of atoms in the amorphous phase is given by

$$L - N = L[1 - e^{-2\theta}(T^{\frac{1}{2}} - T_m^{\frac{1}{2}})]$$

Using this expression we are explaining the equation of state, specific heat, surface tension, viscosity and diffision of liquids in other papers.

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