Proceedings of the Iowa Academy of Science

Volume 41 | Annual Issue Article 78

1934

A Study of the Cybotactic Group Structure in Isopentane near the Critical Point

Carl A. Benz
State University of Iowa

Investigation indicates that the desensitizing effect of the cathode ray exposure can be simulated by application of heat, although the temperature to which the emulsion must be raised is surprisingly high. Experiments with other materials indicate that local temperatures in the rayed object may be very high. The importance of this finding has not been appreciated by those working in biological fields.

DEPARTMENT OF PHYSICS,
IOWA STATE COLLEGE,
AMES, IOWA.

THE M-SERIES ABSORPTION SPECTRUM OF METALLIC BISMUTH

W. D. PHELPS

Using a Siegbahn vacuum spectrometer and thin films of bismuth produced by sputtering, the wavelengths of the five x-ray M-absorption edges of bismuth 83 have been measured. For the edges M_1 and M_2, which had not previously been measured, the discrepancy between the computed and observed values is of the order of magnitude of experimental error while the usual large M_4 and M_5 discrepancies, first observed in this laboratory on other elements, are verified for bismuth. An interpretation of the large discrepancies between the experimental and computed wavelengths of the edges M_4 and M_5 based on experiments in other fields on the one hand and Block's and Kronig's wave-mechanical theory of energy levels in a crystal on the other is suggested. It is concluded that the M_1, M_2, and M_3 electron in an absorption act go to the top of the filled free-electron levels while the M_4 and M_5 electrons go on out to higher energy levels of the crystal lattice.

DEPARTMENT OF PHYSICS,
STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.

A STUDY OF THE CYBOTACTIC GROUP STRUCTURE IN ISOPENTANE NEAR THE CRITICAL POINT

CARL A. BENZ

X-ray diffraction curves of scattered intensity as a function of angle have been measured using a Coolidge Molybdenum x-ray tube, and an ionization chamber spectrometer.

Curves have been taken at various conditions of specific volume, temperature and pressure over the isothermal diagram. It is found that as the specific volume is increased, the diffraction pattern changes from one typically liquid to one typically gaseous, with patterns in between having similarities to both liquid and gas curves. This change is not abrupt, but takes place gradually, and at specific volumes well into what is commonly known as the gaseous region.

The results indicate that there is no sharp transition as the gaseous state is approached, and that the cybotactic groups appear in regions commonly known as gas if the specific volume is kept near to that of a liquid.

DEPARTMENT OF PHYSICS,
STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.

STRUCTURE OF SOLUTIONS OF STRONG ELECTROLYTES IN N-ALCOHOLS AND WATER

G. W. STEWART

Although great advances have been made in the adoption of theory to the conception of the structure of electrolytes, it has been shown by Fowler and Kramers in an exact statistical treatment that the current theories are significant largely from an empirical point of view. Any theory which uses only Coulomb forces and not all of the molecular forces, must be inadequate. The structure of electrolytes remains one of the challenging problem at the present time. The method of x-ray diffraction is crude and is not very promising as a method of attack, yet the evidence which might be accumulated thereby is important. Experiments conducted in this laboratory indicate at present the following:

(1) That in the solution of LiCl in alcohol, there is a combined liquid structure much as if liquid alcoholate were thoroughly mixed with the n-alcohol, the two forming a single cybotactic structure.

(2) With some strong electrolytes in water LiCl, $MgCl_2$, $(NH_4)_2\,SO_4$, NH_4Cl, and NaCl, the results point to a similar single liquid structure, this being a combination of the equivalent of two liquids.

(3) But in the case of LiCl in water, the result may be accounted for by assuming a submicroscopic emulsion consisting of a $LiCl\text{-}H_2O$ structure in water as a solvent. Such a curious