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SUMMARY OF THE RESEARCH PROGRESS MEETING OF JUNE 19, 1952

Bonnie E. Cushman

July 11, 1952

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Berkeley, California
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I. Crystal Structure of YCl₃. G. Carter

The study of YCl₃ is of interest because its crystal structure is the same as that of the chlorides of the heavier rare earths. YCl₃ crystals were prepared by the reaction Y₂O₃ + 6HCl(g) → 2YCl₃ + 3H₂O. The product was heated to its melting point and, after cooling, the resultant mass was broken into fragments. Single crystal technique was used in taking the x-ray diffractions patterns as the structure is quite complex. Work was done in a dry box because of the hydroscopic nature of the material. Density measurements indicate four Y and twelve Cl atoms per unit cell. The crystal is monoclinic with six layers along the b axis and cleavage quite marked in a b plane. There is two fold symmetry perpendicular to a mirror plane in the direction of the b axis. The structure and parameters are almost identical with those of AlCl₃. Measurements are listed below.

| Melting Point | 680°C |
| Density Observed | 2.55 gms/cm³ |
| Density Calculated | 2.60 gms/cm³ |
| Cell Dimensions: | a 6.92 Å  
| | b 11.94 Å  
| | c 6.44 Å  
| | β 110° 20' |
| Interatomic Distances: | Y-Y 3.99 Å  
| | Y-Cl 2.65 Å  
| | Cl-Cl 3.54 Å and 4.38 Å |
Polarization effects are striking when one considers that the diameter of the Cl ion is 3.62 Å.

II. Further Identification of the Reaction $p + d \rightarrow \pi^+ + t$. K. Bandtel

The angular and energy correlations of the pion - triton coincidences in the reaction $p + d \rightarrow \pi^+ + t$ have been examined. The experimental results are shown in Fig. 1; both the pion energy and triton energy are determined by the pion angle. Time of flight measurements eliminated the background problem. The time of flight from target to telescope of the elastically scattered particles was about two to three times the resolution time of the quadruple coincidence circuit used. The absorbers were such that the particle was near the end of its range as it hit the stilbene counter so that the largest pulses possible were obtained. Absorber thickness was varied to obtain a range spectrum and check the identification of the particle. The telescope levels were raised and lowered to check the position for optimum counting rate. The horizontal angle was also varied. The counting rate ratio in the $\text{CD}_2$ and C targets was three to one.
Fig. 1