

## Preliminary Communications

### A New Isomer of Hexachloro- Cyclohexane with Zero Dipole Moment

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The determination of the molecular structure of the different benzene hexachlorides (CHCl)<sub>6</sub> would be of great interest, but demands a considerable amount of precise work. The only isomer the configuration of which is well established is the symmetrical  $\beta$  compound<sup>1</sup> in which the Cl atoms have the positions  $\kappa, \kappa, \kappa, \kappa, \kappa, \kappa$ . Besides this substance a second isomer with zero dipole moment should exist in which the chlorine atoms 1 and 4 are in  $\epsilon$  positions ( $\epsilon, \kappa, \kappa, \epsilon, \kappa, \kappa$ ). It is known that the  $\alpha$ ,  $\gamma$  and  $\delta$  isomers have considerable dipole moments, the moment of the  $\epsilon$  isomer<sup>2</sup> has not been determined.

Cyclohexane and monochloro-cyclohexane were treated with gaseous chlorine under cooling but using strong artificial light until no further absorption of chlorine could be observed. From the different fractions obtained by distillation *in vacuo* of the reaction product some new substances were prepared. One of these is a chloride C<sub>6</sub>H<sub>6</sub>Cl<sub>6</sub> of m. p. 145° C obtained from the most volatile part of the product.



Calc.	Mol. wt.	290.9	Cl	73.1
Found	»	» 285, 286	»	» 72.0, 72.5

(Cryoscopic molecular weight determination in benzene.)

Monoclinic unit cell contains 4 molecules ( $a = 11.1$ ,  $b = 6.78$ ,  $c = 14.0$ ;  $\beta = 98^\circ$ ).

The result of dielectric constant measurements of very dilute solutions in benzene and carbon tetrachloride may be expressed

by the ratio  $\frac{\Delta \epsilon}{x}$  ( $x$  being the mole fraction of hexachloride):

	C <sub>6</sub> H <sub>6</sub>	CCl <sub>4</sub>	
New substance:	0.552	0.536	( $x$ ranging from 0,001 —0,007)
$\beta$ isomer:	0.847	—	( $x = 0,002$ )

There can be little doubt that the dipole moment is in fact zero. If we exclude the possibility (which seems very improbable) that the substance contains two CCl<sub>2</sub>-groups and two CH<sub>2</sub>-groups, the conclusion must be drawn that the new substance is in fact a sixth isomer in the series of benzene hexachlorides having the configuration of Cl atoms given above ( $\epsilon, \kappa, \kappa, \epsilon, \kappa, \kappa$ ). (Small quantities of the converted, energetically less stable configuration  $\kappa, \epsilon, \epsilon, \kappa, \epsilon, \epsilon$  may occur in solution or in the vapour). We therefore propose the designation  $\zeta$  benzene hexachloride for the new substance.

Preliminary experiments on insects indicate that the isomer is almost inactive as a contact poison.

- Hassel, O. *Tids. Kjem. Bergv. Met.* 3 (1943) 32.
- Kauer, K. C., DuVall, R. B., and Alquist, F. N. *Ind. Eng. Chem.* 39 (1947) 1335.

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### Note on the Cleavage of Insulin by Chymotrypsin

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Crystalline insulin has been digested with crystalline chymotrypsin until the amino nitrogen was constant. The reaction

was followed with chromatograms on paper strips<sup>1</sup> using ninhydrin as a developer. The formation of six distinct components was observed with different  $R_F$ -values in pyridine-amyl alcohol: 0.11; 0.20; 0.25; 0.29; 0.38; 0.55. These components all appeared early in the digestion and apparently increased in amount with time but no formation of additional split products was observed. During the digestion, however, a considerable amount of a gelatinous precipitate was formed and this has not been investigated.

Attempts were also made to separate the split products. Partial separation was achieved through the use of chromatography on starch<sup>2</sup> in pyridine-amyl alcohol. One of the component,  $R_F = 0.55$ , was obtained in the form of needle-shaped crystals. Other fractions were not homogeneous as judged by the paper strip method. These experiments are now continued with the aim of obtaining a more complete separation and larger amounts of the components.

Concerning the nature of the observed split products nothing definite can now be said although it seems likely that at least some of them are peptides. It is hoped that a closer investigation of these products will throw some light on the structure of insulin.

The fact that paper strip chromatograms on samples from different stages of the digestion do not differ qualitatively is taken as an indication that the enzyme splits one substrate molecule to completion before it attacks the next one. This gives additional support to the hypothesis of protease action advanced by Tiselius and Eriksson-Quensel<sup>3</sup>.

A detailed paper will be published later.

1. Consden, R., Gordon, A. H., and Martin, A. J. P. *Biochem. J.* **38** (1944) 224.
2. Elsdon, S. R., and Synge, R. L. M. *Biochem. J.* **38** (1944) ix.
3. Tiselius, A., and Eriksson-Quensel, I.-B. *Biochem. J.* **33** (1939) 1752.

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