Conformational Analysis of Poly-γ-benzyl-glutamates by Monolayer Method

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It has been found that esters of polyglutamic acid and synthetic polypeptides with long hydrocarbon side-chains yield well defined transition points in force-area curves.[1-3] In the present communication, we wish to report the relation between the temperature coefficient of the monolayer transition pressure and the conformation of synthetic polypeptide in the solid state.

The polymers examined were L, DL-copolymers of γ-benzyl-glutamate $(L/(D+L)=0.5$—$1.0)$. They consist of regular helix, perturbed helix and random coil, and were analyzed by means of infrared spectroscopy.[4,5] No β-components were detected. The polymers were dissolved in purified chloroform, and spread on the surface of twice-distilled water filled in a Teflon trough. The initial spreading area was 55 Å²/residue, and com-
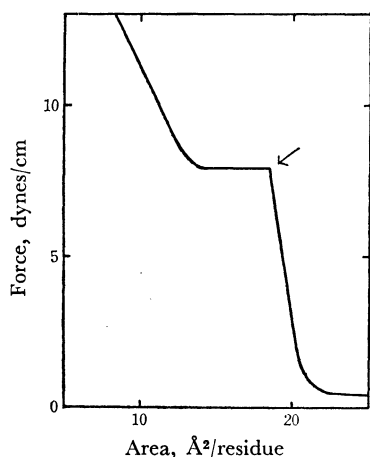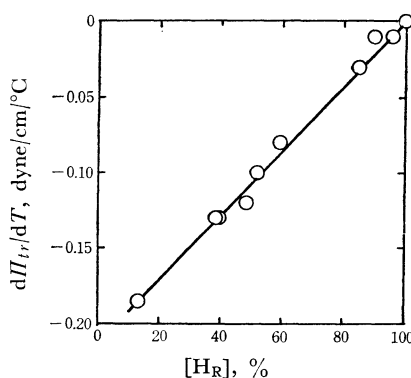

Fig. 2.　Plot of dII_{tr}/dT *versus* [H_R].

pressed at the rate of 0.2 Å²/residue/min. The surface pressure was measured by the Wilhelmy method at temperatures 10—20°C, where a linear relationship was obtained between the film transition pressure and temperature.

Figure 1 shows a typical force-area curve for poly-γ-benzyl-DL-glutamate, where a transition point can be seen. In Fig. 2 is shown the plot of temperature coefficient of the transition pressure dII_{tr}/dT *versus* percentage of regular helix [H_R] for poly-γ-benzyl-glutamate monolayers. The value of dII_{tr}/dT is negative, and increases linearly with the increase in [H_R]. At 100% regular helix, dII_{tr}/dT is zero. The relation between dII_{tr}/dT and [H_R] can be expressed in the form

$$\frac{dII_{tr}}{dT} = -2.125 \times 10^{-1} + 2.125 \times 10^{-3}[H_R]$$

From this equation, we can estimate the content of regular helix in poly-γ-benzyl-glutamate by means of the monolayer method. Usually, the amount of polymer required to determine a transition pressure is small (less than 50 μg).

As regards the percent total helix (percent regular helix + percent perturbed helix), no simple linear relationship was found between the temperature coefficient and the percent total helix.

The present results appear to indicate that the regular helix is stable even in the monolayer state. Conformation of poly-γ-benzyl-glutamates at the interface will be discussed elsewhere.

Fig. 1.　Force-area curve for poly-γ-benzyl-DL-glutamate.
　20°C; [H_R] =38.5%

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