tions (hence in μ), and in the frictional forces between segments of solute molecules and the surrounding solvent (hence in k'). The directions and magnitudes of these effects, however, are difficult to predict without further information.

One may predict similar effects for other high polymers of the general formula $(CH_2CHR)_n$, but not for polyethylene nor for polymers having the general formula $(CH_2CR_2)_n$, with all R groups alike. Experiments are in progress here to test this prediction.

It may be noted that randomness of the H and R dispositions relative to the chain bonds is probably also responsible (in part) for the general poor degree of crystallinity of stretched $(CH_2CHR)_n$ polymers, as shown by X-ray diffraction data.[2]

(2) M. L. Huggins, Paper presented at the Rochester meeting of the American Physical Society, June 24, 1944.

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STOICHIOMETRIC COMPLEXES OF SERUM ALBUMIN AND SODIUM DODECYL SULFATE

Sir:

Electrophoretic and chemical analyses indicate that complex formation between crystalline horse serum albumin (A) and purified sodium dodecyl sulfate (D) is due to stoichiometric combination.

In phosphate buffer, *p*H 6.8, $\mu = 0.2$, three electrophoretic components, A, AD_n, and AD_{2n} have been identified by their respective mobilities, 4.9, 7.8, and 9.8 $\times 10^{-5}$ cm.^{2} sec.$^{-1}$ volt^{-1}. Either or both complexes may be present in solution, their proportion depending on the protein–detergent weight ratio. The electrophoretic composition of AD_n and AD_{2n} corresponds, respectively, to the maximal and minimal weight ratios requisite for complete precipitation of the protein at *p*H 4.5.[1]

Likewise, mixtures corresponding to these ratios are essentially homogeneous in electrophoresis. This agreement suggests that between *p*H 4.5 and 6.8, combination is independent of *p*H and involves protein groups, presumably cationic, whose state of ionization does not change within that range. The amount of D bound in AD_n (0.22 g. per g. protein, *i. e.*, $n = 55$ moles D per mole A) corresponds approximately to one-half the acid binding capacity of A while that bound in AD_{2n} (0.42–0.45 g.) is equivalent to the total acid binding capacity.

On both sides of the isoelectric point, low *molar* concentrations of D cause a large increase in the *relative* viscosity of serum albumin.[2] However, up to a protein-detergent weight ratio of one, at *p*H 6.8, the increase of the *intrinsic* viscosity (η_{sp}/c) depends only on the weight ratio. In this region, with decreasing A/D ratios, η_{sp}/c first remains nearly constant because the intrinsic viscosity of AD_n is comparable to that of A (4.3 *vs.* 4.1). Thereafter, η_{sp}/c increases because the intrinsic viscosity of AD_{2n} is higher (6.1). A further increase results from more extensive unfolding of the complex.

AD_n probably consists of albumin covered with a single hydrophobic layer of detergent anions bound to cationic groups. It is unlikely that AD_{2n} results from non-polar adsorption of a second layer of detergent to AD_n, with hydrophilic groups exposed, because: (1) both AD_n and AD_{2n} are insoluble below *p*H 4.8; (2) AD_{2n} but not AD_n exhibits a large viscosity increase over A. The formation of AD_{2n} is tentatively ascribed to the partial unfolding of AD_n with liberation of additional cationic groups hitherto accessible to hydrogen ions but not to large detergent anions. The viscosity increase observed with additional detergent indicates further unfolding either with: (a) formation of a third postulated complex, AD_{4n}, representing non-polar adsorption of D by AD_{2n}, or (b) by non-stoichiometric association of detergent molecules with all available groups.

Quantitative studies of complex formation with detergent mixtures are complicated by the dependence on chain length of the equilibrium between free and combined detergent.

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(1) F. W. Putnam and H. Neurath, THIS JOURNAL, **66**, 692 (1944).

(2) F. W. Putnam and H. Neurath, paper presented before the Division of Physical and Inorganic Chemistry at the 107th Meeting of the American Chemical Society at Cleveland, Ohio, April 4, 1944.