Letters to the Editor

The Editor does not hold himself responsible for opinions expressed by his correspondents. He cannot undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.*

NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 33.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Adsorption of Aluminium Hydroxide by Kieselguhr

ALUMINIUM hydroxide is readily adsorbed by kieselguhr to form an adsorption complex which is remarkably stable. The hydroxide is deposited by the slow addition of a small excess of ammonia to a de-aerated suspension of 10 gm. of specially purified Superfloss kieselguhr in 100 c.c. of 2 per cent ammonium nitrate solution containing a known amount of aluminium nitrate, the suspension being vigorously stirred. The curve (Fig. 1) shows the relation between the ζ value of the preparations in $N/10$ acetic acid and the amount of aluminium hydroxide adsorbed by 100 gm. of kieselguhr.

This curve indicates that the surface of 100 gm. of kieselguhr is completely coated by 0·00486 gm.-mol. of aluminium hydroxide and that a maximum ζ value of +75·4 mv. is then obtained. Increasing the amount of aluminium hydroxide causes a decrease in the ζ value until a value of +61·2 mv. is reached, when 0·00972 gm.-mol. has been deposited. The deposition of further quantities of aluminium hydroxide does not change the ζ value of 61·2 mv., which is that of free unsupported aluminium hydroxide in $N/20$ acetic acid.

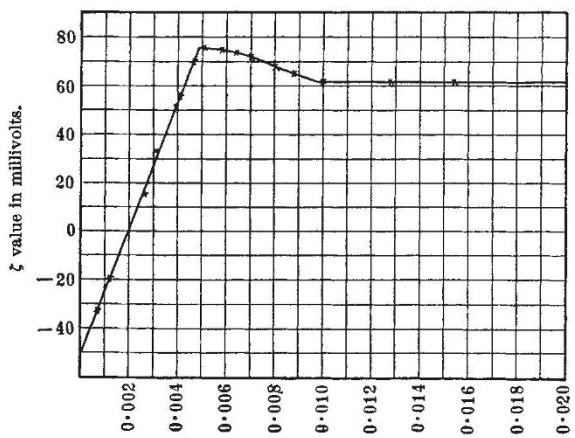

FIG. 1.

The total surface area of 100 gm. of the kieselguhr was determined by measuring the rate of sedimentation by the international pipette method, the assumption being made that the particles are spherical. By differentiation of the cumulative percentage curve, the values of $dW/d\log r$ were obtained and from these the values of $dS/d\log r$ were calculated. The area under the $dS/d\log r$, $\log r$ curve gave the total surface area as $1{\cdot}54 \times 10^6$ sq. cm. and it is manifest that this must be much less than the true surface area. If the true surface area be taken as five times that calculated, that is, $7{\cdot}7 \times 10^6$ sq. cm., then when 0·00486 gm.-mol. of aluminium hydroxide completely covers that area the diameter of each particle of the hydroxide on the surface is found to be $5{\cdot}77 \times 10^{-8}$ cm. Since this is of molecular dimensions, it follows that aluminium hydroxide is first adsorbed as a uni-molecular layer by the kieselguhr surface and that when this layer is completed the ζ value is +75·4 mv. It further follows that when a second uni-molecular layer of aluminium hydroxide has been deposited, the ζ value falls to +61·2 mv. and that this second layer has the same properties as the un-adsorbed substance.

Since the number of aluminium hydroxide molecules in the first and second layers must be the same, the enhanced ζ value indicates that the molecules in the adsorbed uni-molecular layer must be activated in some way. The observations, therefore, are analogous to those of de Boer and his colleagues[1].

In explanation of this activation, it may be suggested that an adsorption complex is formed of the type proved to exist in the case of solvates[2]. If the molecules in the surface be denoted by E and those of the adsorbed substance by S, the adsorption complex will be represented by E^-S^+, the molecule E having given one or more of its rotation-vibration quanta to the molecule S. Since this transference of energy cannot take place unless the two molecules have rotation-vibration frequencies in common, a surface must possess a selectivity in its absorptive power. It is interesting, therefore, to note that kieselguhr does not adsorb iron hydroxide ($Fe(OH)_3$) in spite of the similarity between the properties of $Fe(OH)_3$ and $Al(OH)_3$.

E. C. C. BALY.
W. P. PEPPER.

University,
Liverpool.
June 8.

[1] *Physica*, 1, 753, 935, 953, 960; 1934.
[2] B.A. Report, 1928, p. 35.

Spontaneous Super-Contraction of Animal Hair

SUPER-CONTRACTION induced in silk fibres by acid, and in wool by means of steam and chemical reagents, has been described by Farrell[1], Astbury and Woods[2] and Speakman[3] respectively. I have recently obtained evidence of super-contraction in the guard hairs of raw pelts taken from fur-bearing animals, the phenomenon probably arising through oxidation of