

## LETTERS TO THE EDITOR.

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## On the Geiger-Nuttal Relation.

It is well known that the velocity of the particles emitted by radioactive substances is determined from an experimental measurement of the range and the empirical relation of Geiger-Nuttal, connecting the range with the velocity. An attempt to deduce a similar formula on theoretical grounds, was made by Bohr as early as 1913. Recently, Gaunt<sup>1</sup> and Bethe<sup>2</sup> have deduced the corresponding wavemechanical formulæ. In these theories the classical dynamics is freely used at a later stage, to arrive at a formula somewhat analogous to that of Bohr. Moreover, Bethe's formula involves a function which is computed with difficulty.<sup>3</sup>

According to the wavestatistical theory, which is just developed and is being published elsewhere, the general relation connecting the range (R) with the velocity (v) is of the form

$$R = \dots + a_2v^2 + a_3v^3 + a_4v^4 + a_5v^5 + \dots$$

where  $a_2, a_3, \dots$ , etc., are constant coefficients. It may be remarked that  $v^3$ - and  $v^4$ -terms are found to be important, the other terms coming only as approximations. Thus Geiger's  $v^3$ - and  $v^4$ -rule for low and high velocity, is supported by the wavestatistical theory.

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Calcutta,  
June, 1936.

## Constitution of Formic Acid and the Formates.

IN a letter to the Editor Mr. Halasyam<sup>1</sup> suggests that the values used by me for the calculation of the parachor of formic acid<sup>2</sup> were an arbitrary selection of the values of Sugden and of Mumford and Phillips. Actually as indicated<sup>3</sup> in foot-note 4 the calculated value (93.2 units) which I gave is the standard value given in Landolt-Bornstein,<sup>4</sup> the atomic and structural constants used in that calculation being those which are generally regarded as the best. The differentiation between hydrogen attached to oxygen and hydrogen attached to carbon adopted in Landolt-Bornstein is an improvement on the original values of Sugden, which is justified in that it enables satisfactory values of the parachor to be calculated not only for formic acid, but also for a wide range of hydroxy-compounds.<sup>5</sup>

Mr. Halasyam in his original calculation of the parachor of the Sarkar-Ray formula for formic acid<sup>6</sup> used Mumford and Phillips' values. In his recent letter<sup>7</sup> he quotes for the classical formula the value of 102.2 using Sugden's unrevised values which are now out of date, and which also give incorrect values for other acids, for which there is no question of an alternative formula. As indicated in my previous letter, the best modern calculated value for the parachor of the classical formula agrees closely with the experimental value. Mr. Halasyam has nowhere quoted for comparison a Mumford-Phillips value for the

<sup>1</sup> *Proc. Camb. Phil. Soc.*, 1925-27, **23**, 732.

<sup>2</sup> *Ann. der Phys.*, 1930, **5**, 325.

<sup>3</sup> *Vide* Blackett, *Proc. Roy. Soc.*, 1932, **135**, 132,

parachor of the classical formula. These authors<sup>8</sup> calculate on their system the parachor of acetic acid to be 130.6. Deducting their value for  $\text{CH}_2$  (40.0), the value for the classical formula for formic acid comes out to be 90.6 which is sufficiently close to the observed value of 93.6.

It is clear therefore, and in this Dr. Seshadri agrees with me<sup>9</sup> that parachor values cannot be used to distinguish between the Sarkar-Ray and the classical formula for formic acid.

With regard to the abnormal chemical activity of formic acid, Mr. Heble, in this laboratory, has recently observed that formic acid reacts with acetyl and benzoyl chlorides to give the corresponding acid, HCl and CO. It also reacts on heating with benzyl chloride, benzal chloride, and benzo-trichloride with evolution of HCl and CO; on these reactions a method of estimating side-chain halogen has been based.

T. S. WHEELER.

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Bombay,  
June 15, 1936.

<sup>1</sup> *Curr. Sci.*, 1936, 4, 812.

<sup>2</sup> *Curr. Sci.*, 1936, 4, 650.

<sup>3</sup> *Loc. cit.*

<sup>4</sup> *2nd Supplement*, 5th Edition, 1931, pp. 172, 173, 175, 177.

<sup>5</sup> *Cf.* Bhatnagar and Singh, *J. Chim. Phys.*, 1928, 25, 21.

<sup>6</sup> *J. Indian Chem. Soc.*, 1935, 12, 813.

<sup>7</sup> *Loc. cit.*

<sup>8</sup> *J.C.S.*, 1929, 2128.

<sup>9</sup> *Curr. Sci.*, 1936, 4, 813.

### Decolourising Action of Fuller's Earth.

THE decolourising action of fuller's earth and its activation by acids have not yet been satisfactorily explained on chemical or physical basis. Earlier attempts deal with either the chemical constituents of the earth,<sup>1,2</sup> or with the usual absorption theories.<sup>3</sup> Recently Thurman<sup>4</sup> attempted to show the relationship between the pH of the earths and their decolourising action. But according to him, addition of acid or alkali decreased the decolourising power of a Florida earth. Fogle and Ohn<sup>5</sup> attributed the clarifying action of the fuller's earth to its zeolite content, but account has not been taken by these authors of an important characteristic property of these earths, of liberating acid on being shaken with a salt solution.<sup>6</sup> In the course of our work on the activation of fuller's earths obtained from different parts of India, for decolourising vegetable oils, we found that the pH of a solution of sodium chloride after treatment with earths varied in the same manner as the change in the Lovibond units of colour of a sample of groundnut oil treated with the earths. The bleaching values were determined by agitating a sample of neutral groundnut oil with 2 per cent. of the earth at 90°–95° C. and matching the colour with a Lovibond tintometer. For activation, the earths were treated with hydrochloric acid of 19–20 Be' (added as 20 grams of dry HCl per 100 grams of the earth) under reflux for three hours, and washed.<sup>7</sup> For

TABLE I.

No.	Source	Original		Treated with acid and washed			
				Heated to 110° C.		Heated to 400° C.	
		Change Lovibond Units	pH	Change Lovibond Units	pH	Change Lovibond Units	pH
1	Florida .. ..	3.3	3.74	3.1	3.24	3.1	4.02
2	Kolhapur .. ..	1.4	7.22	2.9	3.76	2.0	4.95
3	Jodhpur .. ..	2.4	7.82	2.9	3.47	3.2	3.91
4	Bhawanagar .. ..	1.1	8.81	3.0	4.10	3.2	4.70
5	Murwara, C.P. .. ..	1.4	7.48	1.3	4.71	2.1	6.36
6	Germany .. ..	3.2	3.50	3.3	3.45	3.3	3.60