

0.5 per cent sodium ricinoleate. Streptococci so treated with soap produce agglutinins in rabbits within twenty-four hours following intraperitoneal injection.

173 (2696)

Observations on the measurement of the pH of soap solutions.

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Coincident with Larson's studies¹ on the neutralization of toxins with sodium ricinoleate, studies on the chemical properties of this soap have been conducted. One phase of this work has concerned itself with methods of determining the pH of solutions of this compound. In this work certain important anomalies in the measurement of pH of soap solutions have been observed which are here reported.

All measurements were made with a Leeds and Northrup, Type K. potentiometer, using a .1N Calomel electrode. To investigate the problem thoroughly it was decided to carry out measurements with a series of electrodes instead of relying upon the results obtained from a single one. In all cases the various electrodes were tested with a sodium borate, boric acid buffer. Only those were used that gave correct readings on this buffer solution. From the following table it will be seen that electrodes which gave check readings on the buffer solution would not give check readings on the soap solution:

TABLE NO. 1.

Measurement of pH of a 5 per cent Solution of Sodium Ricinoleate using the Bailey Electrode.²

Electrode No.	pH of Buffer before making readings on Soap	pH of Soap Solution			pH of Buffer after making readings on Soap
		1st reading	2nd reading	3rd reading	
1	8.99	6.99	7.01	6.96	8.99
2	8.99	7.64	7.62	7.65	8.99
3	8.99	7.92	7.90	7.96	8.99
4	8.99	7.98	7.96	8.00	8.99

¹ See Page 357.

² *J. Am. Chem. Soc.*, xlii, 45.

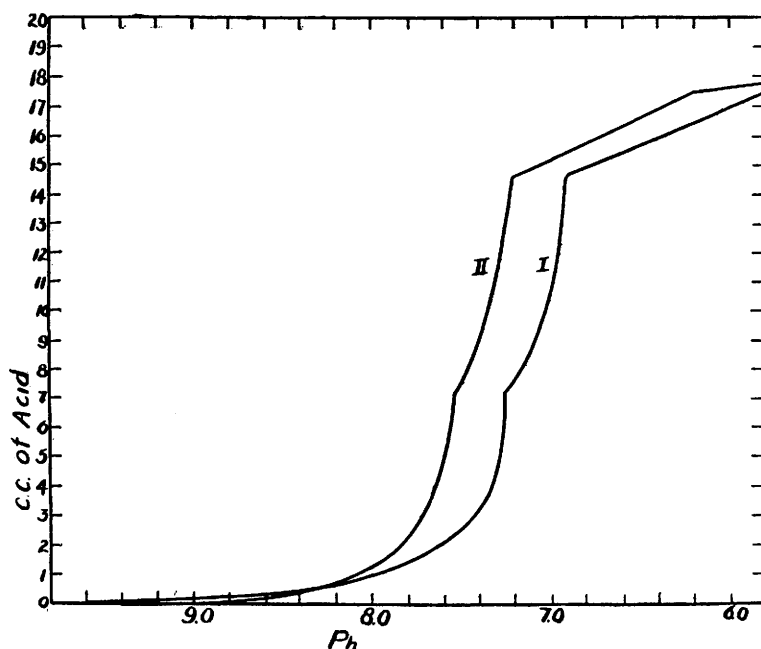
Believing that these anomalies were due to a surface phenomenon, electrode No. 1 was replatinized and then used. The results are given below:

TABLE NO. 2.
Effect of Replatinizing upon the pH reading on a 5 per cent solution of Sodium Ricinoleate.

	pH of Buffer	pH of Soap Solution	
		1st reading	2nd Reading
Before replatinizing	8.99	6.95	6.97
After replatinizing	8.99	7.45	7.40

That each electrode gives fairly consistent results, but that these results differ considerably from those obtained when the electrode is replatinized, is shown by the following graphs. In these graphs the number of cc. of 1/14 N H Cl added to a 5 per cent solution of sodium ricinoleate is plotted against the pH as measured by the electrode after the addition of each cc. of acid. Curve No. 1 was obtained by using the electrode before it was replatinized, and curve No. 2 was obtained by using the electrode after it was replatinized.

A modification of the Hildebrand bubbling electrode gave re-



sults almost as variable. A series of these electrodes were used. The results are given in the following table :

TABLE NO. 3.
pH values obtained on a 5 per cent solution of Sodium Ricinoleate using the bubbling electrode.

Electrode Number	pH of Buffer before measuring the soap	pH of Soap	pH of Buffer after measuring the soap
1	8.99	9.01	8.99
2	8.99	9.03	8.99
3	8.99	9.13	8.99
4	8.99	8.94	8.99
5	8.98	9.08	8.98

It appeared that the electrode could not reach the correct equilibrium; so measurements were made on a solution of a saturated soap. The sodium pelargonate was used, as the higher soaps foamed so much as to interfere with the equilibrium. Readings were taken while the hydrogen was bubbling, and also while the hydrogen was shut off :

The following table gives the results :

TABLE NO. 4.
pH values obtained on a 5 per cent solution of Sodium Pelargonate using the bubbling electrode.

Electrode No.	Buffer before measuring soap		Soap		Buffer after measuring soap	
	Hydrogen Bubbling	Hydrogen Shut off	Hydrogen Bubbling	Hydrogen Shut off	Hydrogen Bubbling	Hydrogen Shut off
1	8.99	8.99	8.86	8.86	8.99	8.99
2	8.99	8.99	8.87	8.87	8.99	8.99
3	8.99	8.99	8.87	8.86	8.99	8.99
4	8.99	8.99	8.86	8.86	8.99	8.99

Using Sodium Bianoleate.

Electrode No.	Buffer before measuring soap		Soap			
	Hydrogen Bubbling	Hydrogen Shut off	Hydrogen Bubbling	Hydrogen 1st r'd'g	Shut off 1*	5*
1	8.99	8.99	8.83	8.45	8.18	8.03
4	8.99	8.99	8.96	8.66	8.39	8.23

*After 1 min., after 5 min.

It appears from these measurements that the platinized electrode acts as a reducing catalyst for the reduction of the sodium ricinoleate which brings about an equilibrium that depends upon

the nature of the surface. With the Bailey electrode this equilibrium had been reached before a reading could be made. Since two electrodes with the same surface cannot be made, it is impossible to make two electrodes that will give check readings on the sodium ricinoleate solutions. Neither is it likely that an electrode will give the same results after being replatinized.

One must also conclude from this work that, because an electrode gives correct readings on a buffer, it does not necessarily mean that it will also give the correct reading on any other non-poisonous solution.