Short Communications

Pakistan J. Sci. Ind. Res., Vol. 14, Nos. 1–2, Feb.–April 1971

STANDARDIZATION OF THIOSULPHATE BY DISPLACEMENT TITRATION USING N-BROMOSUCCINIMIDE

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(Received April 22, 1970)

N-Bromosuccinimide (NBS) has potential uses as an oxidizing titrant in analytical chemistry. Some authors[1–5] have successfully used it for the determination of various organic and inorganic substances. These investigations have been carried out with *N*-bromosuccinimide as a primary standard.

Thiosulphate is usually standardised with iodine or potassium iodate. Iodine solutions being unstable need occasional standardizations before use. This badly affects the accuracy of results in addition to being time consuming. Though potassium iodate method is quite accurate yet its equivalent weight (35.66) being less than that of NBS(89), in this particular reaction, gives superiority to the latter over the former, because the higher the equivalent weight the lesser is the error. Keeping these facts in view it was, therefore, desirable to use NBS as a primary standard for the standardization of thiosulphate.

Experimental

Sodium thiosulphate. A.R. grade substance was used for the preparation of 0.01N solution and standardized with potassium iodate.

N-Bromosuccinimide. 89 mg (exactly weighed) recrystallized product was dissolved in exactly 100 ml of distilled water.

Potassium iodide. 10% w/v solution was prepared from A.R. grade reagent in distilled water.

All other reagents used were of analytical grade. Officially calibrated glass-ware was employed for these investigations.

Procedure

To a definite aliquot of the test solution of thiosulphate in 50 ml Erlynmeyer flask, was added 1 ml each of 10% solution of potassium iodide and acetic acid followed by the addition of a few drops of starch solution as indicator. It was then titrated against standard solution of *N*-bromosuccinimide from a 5-ml burette graduated in 0.02 ml small division. The contents of the flask were thoroughly stirred after each addition of *N*-bromosuccinimide and the end point was reached when bluish tinge persists for about 30 sec.

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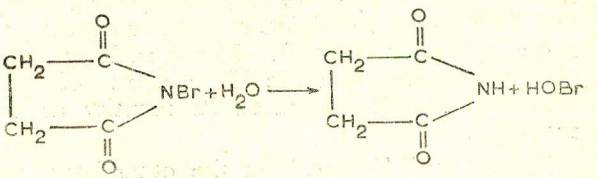
Results and Discussion

TABLE 1.—DETERMINATION OF THIOSULPHATE.

Thiosulphate taken mg	Thiosulphate found mg*	Standard deviation mg
0.31	0.31	0.06
0.62	0.62	0.05
1.24	1.25	0.02
2.48	2.48	0.03
4.96	2.97	0.01
9.92	9.92	0.02

*Each result is the mean of seven titrations.

Table 1 clearly shows that thiosulphate can be standardized with *N*-bromosuccinimide with great accuracy and precision. It can be seen from the following reactions that bromine in +1 oxidation state in *N*-bromosuccinimide oxidizes iodide to iodine with the grain of two electrons thereby changing itself to −1 oxidation state. The normalities of the respective solutions of the substances were calculated taking all these changes into consideration. *N*-Bromosuccinimide is thought to react via the formation of hypobromite. The total reaction is given below:



$$2I' + Br^{+} \longrightarrow I_2 + Br'$$

$$2S_2O_3'' + I_2 \longrightarrow 2S_4O_6'' + 2I'$$

References

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