A Study of Silver - Silver Ascorbate Electrode

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ELECTRODES of several Silver Salts have been found to perform well[1-4]. The standard potential of these electrodes has been calculated and shown to depend on the activity (concentration) of corresponding anions in solution. In this paper an attempt has been made to construct ascorbate ion responding electrode with a view to use it for vitamin 'C' determination.

The preparation of Silver-Silver Ascorbate electrode has been described. Reproducibility and stability of electrode potential has been found to be good. The electrode has been found useful in ascorbate ion concentration determination in neutral, alkaline and alcoholic media. Temperature coefficient of the electrode potential has also been found.

EXPERIMENTAL

A platinium electrode 1 cm long and 0.25 mm dia was prepared. About 0.2 gm of silver was electrodeposited on the wire as described by Vogal[5]. The silver electrode thus prepared, was placed in a solution of ascorbate (0.2 gm ascorbic acid and 0.4 gm sodium ascorbate dissolved and made upto 50 ml with distilled water) for 24 hours to get a thin film of silver ascorbate deposited on the electrode surface. The whole assembly was washed and kept immersed in distilled water for 48 hours so that the electrode could reach to an equilibrium potential.

PL 52 potentiometer along with BG 11 Ballastic galvanometer/lamp and scale arrangement was used for the emf. measurements. Temperatures below room temperature were maintained as described by Chakrabarty[6]. Saturated calomel electrode was used as a reference electrode.

RESULTS AND DISCUSSIONS

The electrode was tested in pure sodium ascorbate solution. The equilibrium potential was reached within a few seconds and remained steady (± 1 mV) upto 5 minutes.

In alkaline, alcoholic and neutral media, electrode potential vs log [ascarbate] curve was linear. In acidic medium, however, no proper response was found. The slopes in neutral medium (pH 7), alcoholic medium and alkaline medium was 0.059 v. 0.062v and 0.074v respectively. The respective standard potential values and slope values have been shown in the talbe 1.

TABLE 1

Sl. No.	Medium	Slope	E°	Usefull concn. range of ascorbate ion
1.	Acidic	Nil	Nil	Nil
2.	Alkaline	0.074	$+0.126$	10^{-2}M to 10^{-4}M
3.	Alcoholic	0.062	$+0.168$	Same
4.	Neutral (pH 7)	0.059	$+0.004$	Same

The electrode potential as a function of temperature has also been found to be linear. From the slope of the line, the temperature coefficient of the electrode potential has been worked out to be $+3.9 \times 10^{-3}$ volt per degree.

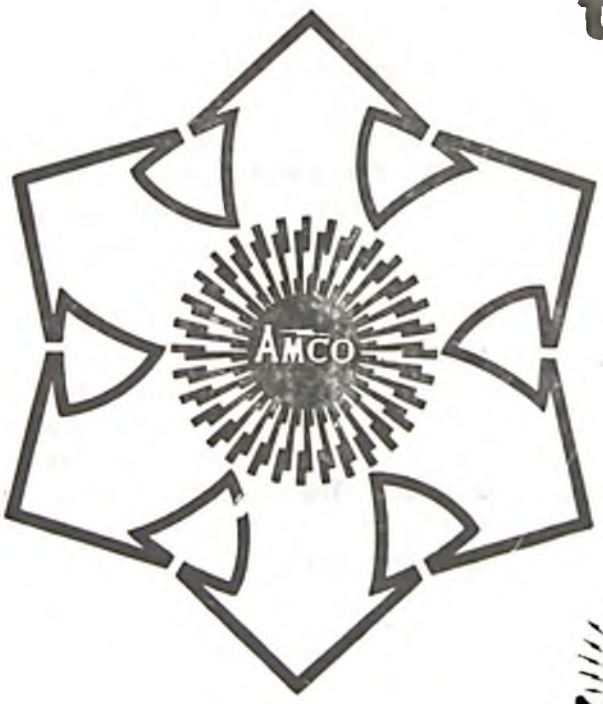
The electrode holds a good future as it is quite convenient to prepare to store and in use. The only precaution is that it is to be kept immersed in distilled water after use. Further work is in progress to use this electrode in ascorbate concentration determination in various juices said to be containing vitamin C.

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