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ANODIC VOLTAMMETRY OF NORGAMAN AT ROTATING DISC PLATINUM AND GOLD ELECTRODES

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ABSTRACT

Norgaman has been examined by anodic rotating disc electrode voltammetry in buffered media over the range of pH from 0-11.5. The best medium is 0.1 mol 1^{-1} sulphuric acid in which the anodic wave is well defined at lower rotation speeds. The compound does not show obedience to the Lesich relationship at platinum and gold electrodes. Rapid determination of the compound is not possible due to the adsorption of the oxidation product. Electrode mechanism for the reaction has been elucidated.

Introduction

4-Thiozolidinc Carboxylic acid (Norgaman) is a drug of important biological significance used in the treatment of tumours (Brugarolas and Gosatvez 1980) and has a potential to cure cancer (Brugarolas and Alberti 1980). The drug is rapidly absorbed by the gastrointestinal tract and is metabolised in the liver (Gernier et al., 1980).

The present investigation has been carried out on the electrochemical characteristics of the drug using rotating disc electrode to suggest the possible electrochemical mechanism for its action.

Materials and Methods

The rotating electrode assembly and its associated electronics, the procedures for electrode activation, voltammetry and coulometry, the reagents and solution handling have been previously described (Bishop and Hussein 1984). The sample was kindly supplied by laboratories Riker, France of pharmacoepial standard.

Results and Discussion

The compound was scanned both anodically and cathodically to the potential limits set by the solvent at both platinum and gold electrodes in buffer media ranging from 1 mol 1^{-1} sulphuric acid through to sodium carbonate solution at pH 11.5

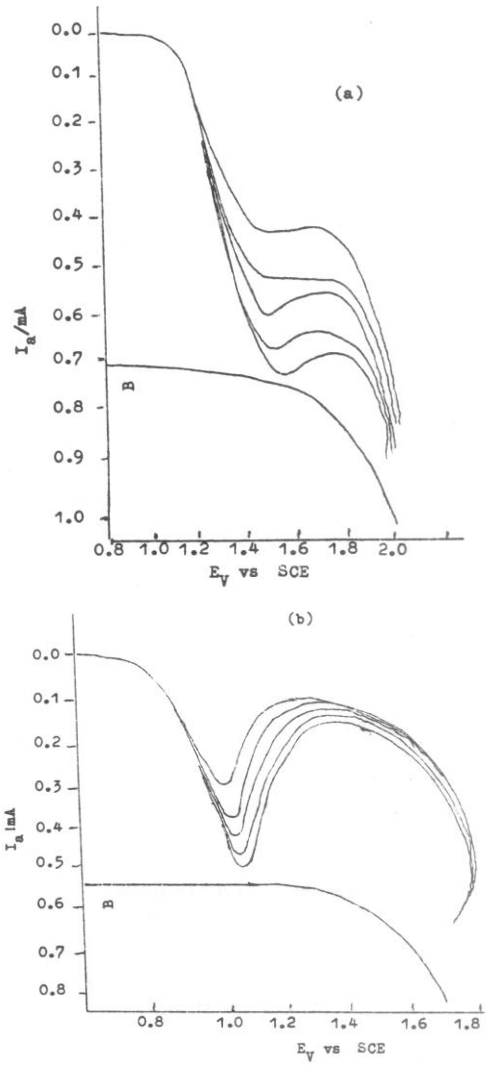

Fig. 1: Voltammetry of 5 x 10^{-3} Mol 1^{-1} norgaman in 0.1 mol 1^{-1} Sulphuric Acid at (a) Platinum and (b) gold RDE conditions nominal rotation speeds (1) 10Hz (2) 20Hz (3) 30Hz (4) 40Hz (5) 50Hz Scan speed 5.0 mVs^{-1} electrode area 0.503 cm.

Voltammetry in 0.1 mol 1^{-1} sulphuric acid

The compound showed anodic activity and gave well defined oxidation wave at lower rotation speed at gold and platinum electrodes. As the rotation speed is in-creased (30 to 50 Hz), the voltammograms change to peak then show a through region. The peak moves to more positive potential as the rotation speed increases (Figure la). The wave shape is generated by adsorption of the oxidation product as confirmed by suppression of the wave on repetition of the scan at 50 Hz without intervening reactivation of the electrode as shown in the displaced curve B. At gold electrode the peak from lower to higher rotation speed follows to trough because of adsorption which is stronger at gold electrode (Figure 1b) than at platinum as shown by the curve B. The plots of limiting current against square root of rotation speed are reasonably straight lines but the intercept is non-zero. The plot of limiting current against concentration is not good showing some curvature indicate of the enhanced mass transport caused by adsorption. Similar phenomenon is reported by Alvarez et al., 1986.

The influence of pH has been studied for 10^{-3} mol 1^{-1} of the drug at a single rotation speed, 50 Hz. After the scan with activated electrode a second scan without intervening activation was made to find out the on set of adsorptive deactivation. A pH 1 peaking occurs and adsorption progressively increases as the pH rises. A peak persists at activated electrode upto pH 7 but total suppression occurs at an uactivated electrode.

An attempt was made to elucidate the reaction mechanism and to determine the number of electrons involve by amperostatic coulometry (Bishop and Hussein 1984) and a value of n=4 has been obtained as shown in the Figure 2.

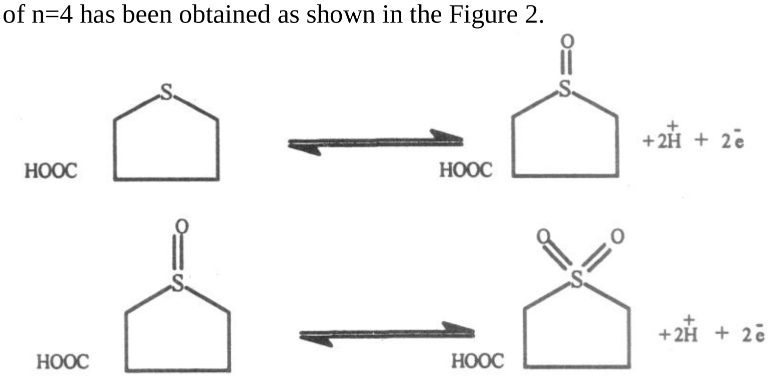

Fig. 2: Electrooxidation of Norgaman

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