

C V N O T E S

Sulfur Dioxide Reduction

Elimination of Cathode Reduction Product Passivation in $\text{LiAlCl}_4 \cdot 3\text{SO}_2$ Electrolyte

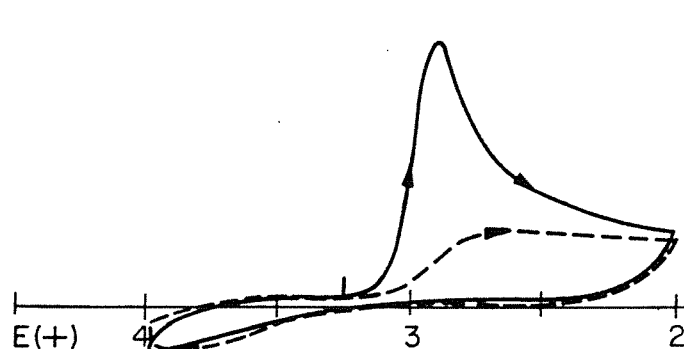


Figure 1. Cyclic Voltammogram at smooth carbon electrode in $\text{LiAlCl}_4 \cdot 3\text{SO}_2$ at 100 mV/sec.

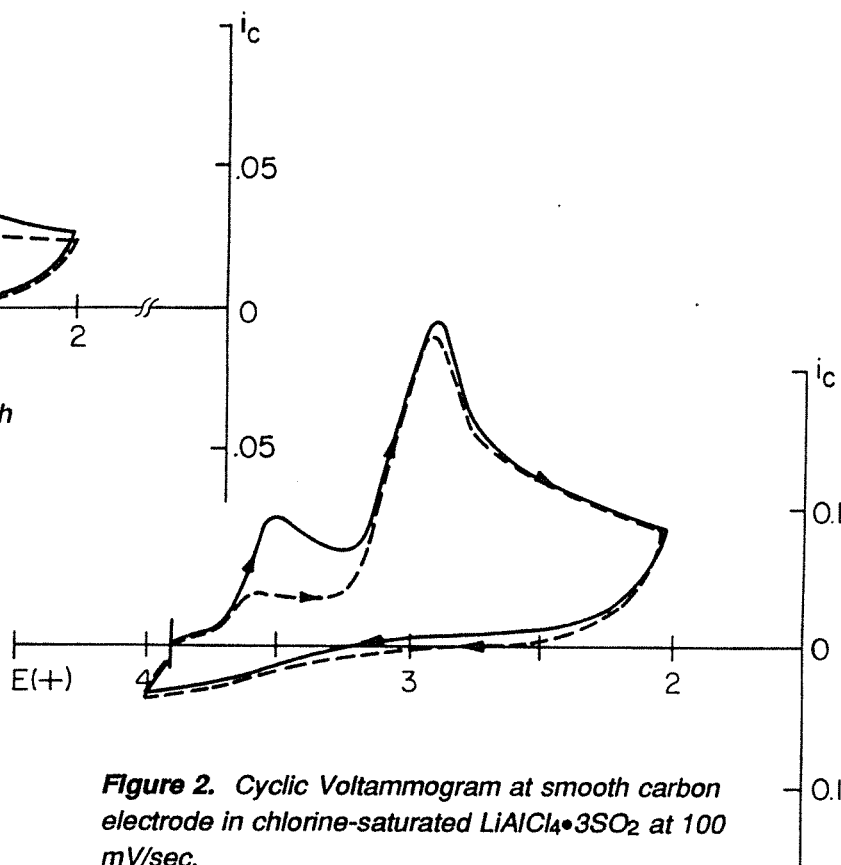


Figure 2. Cyclic Voltammogram at smooth carbon electrode in chlorine-saturated $\text{LiAlCl}_4 \cdot 3\text{SO}_2$ at 100 mV/sec.

Sample: $\text{LiAlCl}_4 \cdot 3\text{SO}_2$

Rate: 100 mV/s

Etrode: Vitreous Carbon Rod, 3 mm Diameter*

Ref: Lithium

The primary reduction product of electrolytes containing SO_2 is the dithionite ion. In the presence of lithium cations, insoluble lithium dithionite forms which coats the electrode and leads to poor current-carrying capability. This is shown in Figure 1 where a repeat voltammetric reduction scan at a smooth carbon rod in liquid $\text{LiAlCl}_4 \cdot 3\text{SO}_2$ electrolyte shows severely decreased current.

If the undesirable reduction product could be chemically oxidized directly, by an added oxidizing agent for example, the passivating film would be removed as quickly as it forms. This concept is indeed valid as seen in Figure 2. Here, in a chlorine-saturated electrolyte, repeat reduction scans show no significant reduction in current-carrying capability. This is because the Cl_2 oxidizes the insoluble lithium dithionite to soluble sulfur dioxide and lithium chloride.

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