

## Oxidation of ethanol under potential scanning conditions

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The electrochemical oxidation of ethanol in fuel cells is currently considered as an important alternative energy source. For high energy efficiency, complete ethanol oxidation is required, and so CO<sub>2</sub> should be the major product.

In this work a non-dispersive infrared carbon dioxide monitor has been used to measure the amount of CO<sub>2</sub> produced from the oxidation of ethanol in a direct ethanol fuel cell (DEFC). During the oxidation of ethanol, adsorbed CO accumulates on the surface of the Pt anode. Linear sweep and cyclic voltammetry in combination with the CO<sub>2</sub> monitor can be used to investigate its oxidation to CO<sub>2</sub>, and how this influences the yield of CO<sub>2</sub>. The periodic oxidation of adsorbed CO increases the CO<sub>2</sub> yield and so can increase DEFC efficiency.

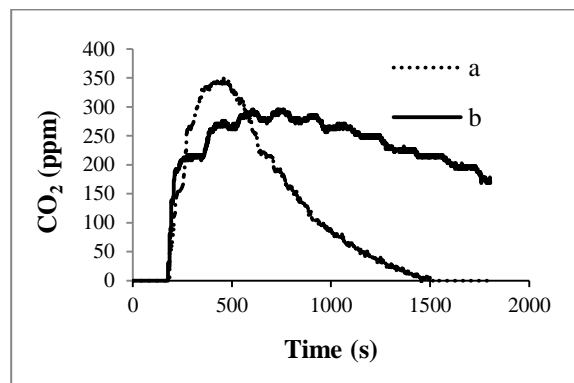
### Linear sweep experiments

As seen in Fig. 1, curve a, stripping of CO from the anode by linear sweep voltammetry while monitoring the CO<sub>2</sub> concentration in the fuel cell exhaust resulted in only a transient production of CO<sub>2</sub>, even when the potential was held at the upper limit of +0.9V for an extended period. This procedure leads to oxidation of adsorbed CO to CO<sub>2</sub>, but negligible sustained ethanol oxidation.

### Cyclic voltammetry experiments

In contrast, it has been found that with cyclic voltammetry, the CO<sub>2</sub> produced increased significantly and was sustained for the duration of the potential cycling period (Fig. 1, curve b). Thus CO that is stripped from the anode at high potentials is replaced by ethanol adsorption and partial oxidation at lower potentials.

Additional results obtained over a range of temperatures and with a variety of anode catalysts will be presented.



**Figure 1.** CO<sub>2</sub> vs. time curves for (a) linear sweep voltammetry (+0.1 V to +0.9 V at 10 mV/s, followed by 28 min at +0.9 V) (b) cyclic voltammetry (+0.1 V to +0.9 V at 10 mV/s) with 0.1M ethanol at the anode and N<sub>2</sub> at the cathode of a DEFC.

### References:

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