

# Dynamic reduction of carbon dioxide on Cu UPD and multilayers porous surfaces by Differential Electrochemical Mass Spectrometry

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The electroactivity of carbon dioxide on various metal has been the subject of numerous investigations [1,2]. CO<sub>2</sub> reduction reaction has a interesting aspect for environmental consideration of atmospheric control. This reaction could contribute to decrease the atmospheric CO<sub>2</sub> concentration and be used to produce natural gas fuel and some other primary material for industrial processes. CO<sub>2</sub> reduction was widely studied on various metals and electrolytes by *ex-situ* analysis (Gas-Chromatography coupled with a Mass spectrometer, High Performance Liquid Chromatography and Ion Chromatography) [3]. However, these methods can only detect the final products. Other methods, such as Differential Electrochemical Mass Spectrometry (DEMS) and FTIR are suitable for *in-situ* analysis. The literature have reported that intermediates products of electrocatalytic reactions can be monitored by DEMS and FTIR under potential control measurements [4,5].

The present paper deals with CO<sub>2</sub> reduction on UDP and multilayer copper on Pt porous substrate. We will show the results of the on-line detection of intermediates formed during the CO<sub>2</sub> reduction. A metallized porous membrane is used as the electrocatalyst as well as an interface between the electrochemical cell and the mass spectrometer. This technique also permits the study of chemisorbed intermediates at different potentiostatic conditions.

In presence of a Cu electrocatalyst, ethanol is formed as well as methane, methanol and ethane

when a gas diffusion electrode is used at very negative potential [6]. We have found similar fragments at the mass spectrometer during the dynamic reduction of CO<sub>2</sub> up to -0.8V. Comparison between CO<sub>2</sub> reduction on Cu adatoms and bulk like metal will be discussed.

## Acknowledgement

The financial support of the Natural Sciences and Engineering Research Council of Canada is gratefully acknowledged.

\* <http://callisto.si.usherb.ca:8080/brisard/>

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