Electrochemical CO_2 conversion: a method of electrode formation and its composition impact on products

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Electrochemical deposition is used to fabricate electro-catalytic coatings for CO_2 conversion - Cu-GSS (Cu coated graphene sheet stack material). Attention is paid on the presence of Cu/Cu_2O nanostructures as it is described by [1]. The structural characterisation by XRD, Raman, SEM methods has been realised (Fig. 1). Data from gas product analysis using quadrupole MS (RGA100) and liquid products in used electrolyte are discussed

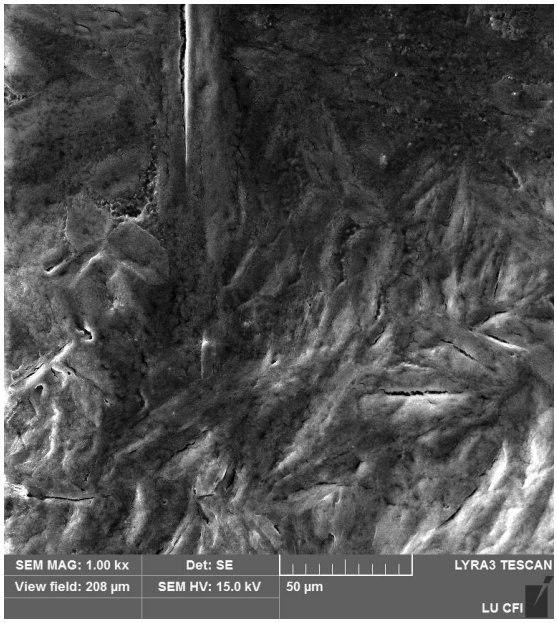

Figure 1. SEM image of GSS coated electrode.

here. The CO_2 electrochemical reduction takes place in well carbonated electrolyte to ensure the presence of OH and CO_3 groups and good contact between them and the catalyst. The gas flow was normalised to fit the samples and Faradaic efficiency (FE) of required product. Relationship between an amount of Cu_2O on electrode surface and H_2 production rate was observed. Samples with high Cu_2O content is present in electrochemically deposited coatings. Their develop larger amount of hydrocarbon molecules and up to 3% of ethyl based compounds, as it can be detect in gas phase. During electrocatalysis the electrolyte exhibits fast pH change in both anolyte and catholyte compartments, but can sustain continuous 150mA current flow through SPEEK membrane for at least 1 hour. The Autolab PGSTAT302N Potentiostat is used to perform electrolysis and information about potential applied, current and charge are collected in 2 electrode setup.

[1] Qiao J, Jiang P, Liu J, Zhang J. Formation of Cu nanostructured electrode surfaces by an annealing-electroreduction procedure to achieve high-efficiency CO2 electroreduction. Electrochem Commun 2014;38:8–11. doi:10.1016/j.elecom.2013.10.023.

Acknowledgement: Funding from European Union's Horizon 2020 Research and Innovation Program project under grant agreement No 768789 is greatly acknowledged.