Bachelor Thesis

Topic: **Electrochemical modification of Boron Doped Diamond (BDD) Electrode with metal catalysts for cathodic CO_2 - reduction**

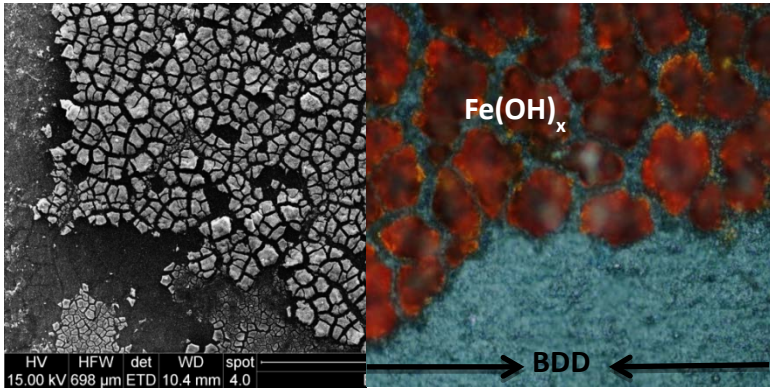
Start: 01.03.2018 or later

Descreption: The application of the electrochemical reduction of CO_2 supplied with renewable energy sources such as solar or wind using the carbon capture and storage (CCS) process could be considered as an ideal hybrid technology to generate carbon neutral fuel or industrial chemical feedstock. This approach can balance between the energy production and consumption for the renewable energy sources whose outputs depend on natural factors.

In the present study, Cu/Sn modified Boron Doped Diamond electrode by electrodeposition technique will be investigated to prepare a suitable electrode based on BDD for electrochemical reduction of CO_2 waste into valuable products. Extensive investigation of the catalyst deposition on the resulting BDD properties has to be carried out in this work.

The effect of the catalyst precursor, supporting electrolyte, electrolyte temperature and pH on the resulting catalyst properties on BDD will be tested and optimized. Moreover, the effect of the boron doping content and surface termination of BDD material for the electrochemical metal catalyst deposition process will be also taken in consideration. Different parameters concerning the BDD support as well as the depositing catalyst will be optimized to get the best catalyst loading, homogenous catalyst distribution as well as better mechanical adhesion between the catalyst and the BDD.

Different characterization methods to characterize the Cu/Sn/BDD such as Scanning Electron Microscopy coupled with Energy dispersive Spectroscopy (SEM-EDX), Raman spectroscopy in addition to X-ray diffraction (XRD) has to be used. The relationship between the potential difference (V) and the electrical current (A) of the Cu/Sn/BDD cathode has to be investigated. The optimized metal catalyst/BDD electrode has to be submitted to accelerated life test to investigate its electrochemical stability test under electrochemical CO_2 reduction condition.



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6.2.2018