Study of copper/copper sulfide composites as catalysts for electrochemical reduction of carbon dioxide

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Research in the field of carbon dioxide (CO_2) utilization towards its conversion into fuels and chemicals is an attractive topic, given the growing global awareness of the risks of increased atmospheric CO_2, the limited supplies of fossil fuels and the increasing energy demand. Driving CO_2 conversion using renewable energies provides a possible route towards closing the carbon cycle. We hereby present a study of copper enriched copper sulfide as a promising catalyst for electrochemical reduction of CO_2. The copper/copper sulfide was synthesized as a powder material via incomplete direct reaction between elemental copper and sulfur in non-aqueous medium. The material was characterized in terms of its chemical composition, structure and morphology. Low amounts of this material were used as an electrochemically active component in preparing composite coatings deposited on glassy carbon substrates. The material was tested as a catalyst for electrochemical reduction of CO_2 and it showed significant activity and stability toward producing compounds that consume >2e^- electrons.

Keywords: CO_2 reduction, electrocatalysis, valuable products, copper sulfides.