Efficient Reduction of CO₂ to Formate Using in Situ Prepared Nano-Sized Bi Electrocatalyst

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doi: 10.20964/2017.03.72

Received: 3 January 2017 / Accepted: 31 January 2017 / Published: 12 February 2017

Carbon dioxide (CO₂) can be reduced to valuable chemicals under the suitable cathode potential. During the electrochemical reduction of CO₂, most metal oxide catalysts will be reduced to zero valent metals. In this work, flower-like Bi₂O₃ precursor has been prepared by the method of hydrothermal synthesis, and it has become pure Bi₂O₃ with irregularly shape after calcination at 500 °C for 2 h. The precursor and Bi₂O₃ have been in situ reduced on the glass carbon electrodes separately, then they are used as the electrocatalysts for CO₂ reduction. The faradaic efficiencies for producing formate on the two electrocatalysts are all up to 82% at a low overpotential of 0.89 V. The electrocatalyst reduced from the precursor possesses larger current density for CO₂ reduction than that reduced from Bi₂O₃, and it is believed to be a promising catalyst for further application.

Keywords: Carbon dioxide; Electrochemical reduction; Formate; Metal bismuth; Flower-like

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