Electrocatalytic reduction of gas-phased CO_2 on SnO_2 electrode surface

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Many approaches to reducing CO_2 are well documented, since CO_2 is considered as the main contributor of global warming. Of these approaches, electrocatalytic conversion of CO_2 (ECC) into useful organic chemicals has attracted interests as a prospect technique. Organic chemicals produced from ECC are dictated according to the catalyst. For improved production of formic acid, tin oxide (SnO_2) is expected to enhance the ECC because metal oxide has high electrochemical stability, adsorption property of gaseous molecules and electrocatalytic activity. In this study, SnO_2 was used as a catalyst electrode instead of tin (Sn), which is generally studied to produce formic acid. Furthermore, to solve some problems such as the mass transfer limitation and product purification from the ionic electrolyte in aqueous ECC, gas-phased ECC was performed as a new approach. Zero-gap cell with gas diffusion electrode and Nafion showed potential because of direct reaction of gas phased CO_2 on the electrode with enhanced surface area. Produced in this method formic acid was analyzed and experimental results for ECC of SnO_2 catalyst electrode were compared with those of Sn electrode.