

Influence of Electrode Assembly on Catalytic Activation and Deactivation of a PT Film Immobilized H⁺ Conducting Solid Electrolyte in Electrocatalytic Reduction Reactions

Authors : M. A. Hasnat, M. Amirul Islam, M. A. Rashed, Jamil. Safwan, M. Mahabubul Alam

Abstract : Symmetric (Cu-Pt|Nafion|Pt-Cu) and asymmetric(Pt|Nafion|Pt-Cu) assemblies were fabricated to study the nitrate reduction processes at the cathode. The electrocatalytic nitrate reduction reactions were performed in these assemblies in order to investigate the prerequisite for the enhanced catalytic activity, electrochemical cell durability as well as preferable product selectivity resulting from the reduction of nitrate at the cathode. It has been observed for the symmetric assembly that Cu particles were oxidized on the anode surface under an applied potential and the resulting copper ions migrated to the cathode surface through the Nafion membrane, which deposited as copper oxide on the cathode surface. The formation of this copper oxide covering layer on the Pt-Cu cathode surface is attributed as the reason for the deactivation of the cathode that governed the reduced nitrate reduction along with increasing nitrite selectivity. These problems were addressed and resolved with the asymmetric design of the electrocatalytic reactor, where enhanced hydrogen evolution activates the surface by eroding the CuO over layer as well as speeding up the slow rate determining hydrogenation reactions.

Keywords : membrane, nitrate, electrocatalysis, voltammetry, electrolysis

Conference Title : ICC 2016 : International Conference on Chemistry

Conference Location : Istanbul, Türkiye

Conference Dates : February 15-16, 2016