催化学报 » 2012, Vol. 33 » Issue (2) :267-274 DOI: 10.1016/S1872-2067(11)60331-8

研究论文

Polysulfide Poisoning of Ag Electrocatalyst during L-Ascorbate Ion Electro-oxidation in Alkaline Solution

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摘要 L-Ascorbate anion electro-oxidation on a silver electrode in hydroxide solution in the absence and presence of sodium polysulfide of concentrations from 1×10^{-5} to 4.5×10^{-4} mol/L was studied using cyclic voltammetry and electrochemical impedance spectroscopy. Both hydroxide and polysulfide ions inhibited L-ascorbate ion oxidation, with the poisoning effect of polysulfide ion being more pronounced in the potential range of –0.3 to –0.2 V/SCE. The time constants for L-ascorbate ion oxidation in the absence and presence of polysulfide were, 10^{-3} to 1×10^{-2} s and 1×10^{-4} to 1×10^{-2} s, respectively depending on the potential used for the impedance analysis. Based on the cyclic voltammetry findings, a mechanism for L-ascorbate oxidation in the presence of polysulfide ions was proposed. Impedance calculations based on the kinetic analysis can account for the occurrence of a negative impedance in a potential region around –0.2 V/SCE in the Nyquist polts.

关键词： L-ascorbic acid polysulfide electrode poisoning silver electro-oxidation

Abstract： L-Ascorbate anion electro-oxidation on a silver electrode in hydroxide solution in the absence and presence of sodium polysulfide of concentrations from 1×10^{-5} to 4.5×10^{-4} mol/L was studied using cyclic voltammetry and electrochemical impedance spectroscopy. Both hydroxide and polysulfide ions inhibited L-ascorbate ion oxidation, with the poisoning effect of polysulfide ion being more pronounced in the potential range of –0.3 to –0.2 V/SCE. The time constants for L-ascorbate ion oxidation in the absence and presence of polysulfide were, 10^{-3} to 1×10^{-2} s and 1×10^{-4} to 1×10^{-2} s, respectively depending on the potential used for the impedance analysis. Based on the cyclic voltammetry findings, a mechanism for L-ascorbate oxidation in the presence of polysulfide ions was proposed. Impedance calculations based on the kinetic analysis can account for the occurrence of a negative impedance in a potential region around –0.2 V/SCE in the Nyquist polts.

Keywords： L-ascorbic acid, polysulfide, electrode poisoning, silver, electro-oxidation

收稿日期: 2011-08-25; 出版日期: 2012-01-17

引用本文:

Fereydoon GOBAL, Laleh MAJARI KASMAEE .Polysulfide Poisoning of Ag Electrocatalyst during L-Ascorbate Ion Electro-oxidation in Alkaline Solution[J] 催化学报, 2012,V33(2): 267-274

Fereydoon GOBAL, Laleh MAJARI KASMAEE .Polysulfide Poisoning of Ag Electrocatalyst during L-Ascorbate Ion Electro-oxidation in Alkaline Solution[J] Chinese Journal of Catalysis, 2012,V33(2): 267-274

链接本文:

http://www.chxb.cn/CN/10.1016/S1872-2067(11)60331-8 或 http://www.chxb.cn/CN/Y2012/V33/I2/267

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