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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH : JURNAL ILMIAH

Judul Karya Ilmiah (artikel) : A simplified kinetics model of natural and iron complexcatalysed hydrogen peroxide oxidation of starch
 Nama Penulis : Andri Cahyo Kumoro, R. Ratnawati, **Diah Susetyo Retnowati**
 Jumlah Penulis : 3
 Status Pengusul : ~~penulis pertama~~/penulis ke tiga/~~penulsi korespondensi~~
 Identitas Jurnal Ilmiah : a. Nama Jurnal : Asia-Pacific Journal of Chemical Engineering
 b. Nomor ISSN : 1932-2143
 c. Vol., No., Bln., Thn. : Vol. 10, No. 5, 20 Mei 2015
 d. Penerbit : Curtin University and John Wiley & Sons, Ltd.
 e. DOI artikel (jika ada) :10.1002/apj.1896
 f. Alamat web Jurnal : <https://onlinelibrary.wiley.com/doi/full/10.1002/apj.1896>
 g. Terindeks di : Thomson Reuter, Scopus (Q2) dengan SJR 2015 = 0,329

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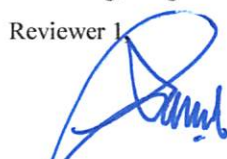
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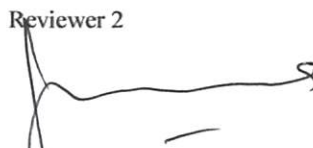
Semarang, Agustus 2020

Reviewer 1



Prof. Dr. Ir. Bambang Pramudono, MS
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 Bidang Ilmu : Teknik Kimia

Reviewer 2



Prof. Dr. Ir. Bakti Jos, DEA
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 Bidang Ilmu : Teknik Kimia

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Judul Karya Ilmiah (Artikel) : A simplified kinetics model of natural and iron complex catalysed hydrogen peroxide oxidation of starch

Jumlah Penulis : 3 orang

Penulis Jurnal Ilmiah : Andri Cahyo Kumoro, Ratnawati R., **Retnowati D.S.**

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Semarang, 31 Maret 2016
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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH: JURNAL ILMIAH

Judul Karya Ilmiah (Artikel) : A simplified kinetics model of natural and iron complex catalysed hydrogen peroxide oxidation of starch

Jumlah Penulis : 3 orang

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d.	Kelengkapan unsur dan kualitas penerbit (30%)	12			12,0
	Total = (100%)	40			38,0
Nilai pengusul = $0,4/2 \times 38,0 = 7,60$					

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Semarang, Maret 2016

Reviewer II

Prof. Dr. Ir. Bakti Jos, DEA
 NIP. 196005011986031003
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Asia-Pacific Journal of Chemical Engineering
Volume 10, Issue 5, September/October 2015, Pages 648-658

A simplified kinetics model of natural and iron complex catalysed hydrogen peroxide oxidation of starch (Article)

Kumoro, A.C. ✉, Ratnawati, R., Retnowati, D.S. 👤

Department of Chemical Engineering, Faculty of Engineering, Diponegoro University, Prof. H. Soedarto, SH Road, Tembalang, Semarang, 50275, Indonesia

Abstract

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Hydrogen peroxide is well known as one of environmentally benign reagents for the oxidation of starch. The aim of this work was to develop a simplified model for the describing of mass transfer and reaction kinetics phenomena of non-catalytic and iron complex catalysed starch oxidation using hydrogen peroxide under alkaline condition. The model was composed based on hydrogen peroxide consumptions for its decomposition and reaction with starch molecules as well as mass transfer between liquid-solid reactants. Effects of starch-water ratio (S/L), catalyst concentration and pH were evaluated. The results show that both non-catalytic and iron complex catalysed hydrogen peroxide starch oxidation follows pseudo-first-order reaction with respect to hydrogen peroxide concentration. The proposed model satisfactorily describes the overall reaction, where very good agreement with experimental data was obtained. Mass transfer between liquid-solid reactants was likely to be the controlling step for the iron complex catalysed starch oxidation using hydrogen peroxide. © 2015 Curtin University of Technology and John Wiley & Sons, Ltd. Copyright © 2015 Curtin University of Technology and John Wiley & Sons, Ltd.

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Prominence percentile: 81.886 ⓘ

Author keywords

carbohydrate controlling rate kinetics modeling solid-liquid reaction

Indexed keywords

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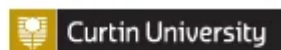
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Research article

A simplified kinetics model of natural and iron complex catalysed hydrogen peroxide oxidation of starch

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ABSTRACT: Hydrogen peroxide is well known as one of environmentally benign reagents for the oxidation of starch. The aim of this work was to develop a simplified model for the describing of mass transfer and reaction kinetics phenomena of non-catalytic and iron complex catalysed starch oxidation using hydrogen peroxide under alkaline condition. The model was composed based on hydrogen peroxide consumptions for its decomposition and reaction with starch molecules as well as mass transfer between liquid–solid reactants. Effects of starch–water ratio (S/L), catalyst concentration and pH were evaluated. The results show that both non-catalytic and iron complex catalysed hydrogen peroxide starch oxidation follows pseudo-first-order reaction with respect to hydrogen peroxide concentration. The proposed model satisfactorily describes the overall reaction, where very good agreement with experimental data was obtained. Mass transfer between liquid–solid reactants was likely to be the controlling step for the iron complex catalysed starch oxidation using hydrogen peroxide. © 2015 Curtin University of Technology and John Wiley & Sons, Ltd.

KEYWORDS: kinetics; modeling; carbohydrate; controlling rate; solid-liquid reaction

INTRODUCTION

Although oxidised starch is primarily used as surface sizing agents and coating binders in the paper industry as well as to provide water holdout for superior printing properties,^[1] its applications in any industries where film formation and adhesion properties are desired steadily increase.^[2] Oxidised starch is commonly manufactured by oxidation of starch using a specific oxidising agent under controlled pH and temperature. Hydroxyl groups on the starch molecules are oxidised to carbonyl and carboxyl groups during the oxidation process, which contribute to the improvement of starch paste stability.^[1] In addition, the reaction also causes degradation of the starch molecules producing a modified starch with low viscosity. This allows the use of oxidised starch in various applications where high solid concentration is needed.^[3]

A number of oxidising agents have been used in the starch oxidation process including sodium hypochlorite, bromine, periodate, permanganate, hydrogen peroxide and ammonium persulfate.^[2] Due to its high efficiency, hypochlorite oxidation is the most common technique for the commercial production of oxidised starch.

Unfortunately, this oxidant may lead to a formation of toxic chlorinated by-products. Alternatively, hydrogen peroxide has also been used as oxidant in a commercial practice to a much lesser extent. Unlike sodium hypochlorite, this oxidant does not generate harmful by-product. During oxidation reaction, decomposition of hydrogen peroxide produces an oxygen atom to oxidise the starch, leaving water as a by-product. For that reason, hydrogen peroxide is therefore considered as a more environmentally benign and preferred oxidant especially when a chlorine-free process is obliged.^[1,4]

Unfortunately, only few studies on the kinetics of starch oxidation by hydrogen peroxide are reported in the literature.^[1,5] Most reported studies were performed in batch reactors and followed by analysing only the final products.^[6,7] It is reported that hydroxyl groups in starch molecules are first oxidised to carbonyl groups and then to carboxyl groups, which primarily occurs at C-2, C-3 and C-6.^[4] This would indicate that the reaction path is consecutive with carbonyl groups as intermediates, which react further to carboxyl groups after prolonged reaction times. Depending on the type of oxidant used, parallel reaction paths are also reported. An oxidant may promote selective formation of carbonyl groups by oxidation of the hydroxyl groups at the positions C-2 and C-3, whereas another oxidant may trigger the hydroxyl groups at the position C-6 to form carboxyl groups.^[8] A study by Tolvanen *et al.*

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The copper ion reduction and oxidation cycle during the cathodic process of gold thiosulfate leaching

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Abstract

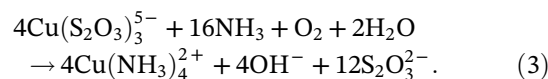
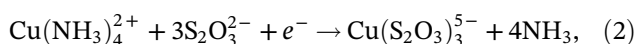
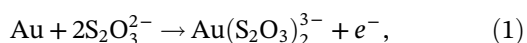
The copper ion reduction and oxidation cycle during the cathodic process of gold thiosulfate leaching was studied using a rotating disc electrode and cyclic voltammetry, and the dynamic characteristics of the system were discussed. In a copper ammonium solution, the redox reactions of $\text{Cu}(\text{NH}_3)_4^{2+}$ were reversible and controlled by substance diffusion. The rotating disc electrode and the reduction method with a constant potential showed that the $\text{Cu}(\text{NH}_3)_2^+$ generated during the reduction process was easily oxidized by O_2 to $\text{Cu}(\text{NH}_3)_4^{2+}$. In the copper ammonium and thiosulfate system, the reversibility of the redox reactions of $\text{Cu}(\text{NH}_3)_4^{2+}$ became worse, and the reduction process was still controlled by material diffusion and had a higher diffusion coefficient than that in the copper ammonium solution. However, under this condition, the oxidation reaction of the generated Cu(I) species was complicated. The reduction method with a constant potential showed that the rate-determining step for the cathodic process was the oxidation step of the Cu(I) species. In addition, some amount of Cu(I) species in solution could not be oxidized in time under the experimental conditions. This part of Cu(I) species may be included during the oxidation decomposition of thiosulfate, thus affecting the dissolution of gold.

KEYWORDS

cathodic process, electrochemical study, gold thiosulfate leaching

1 | INTRODUCTION

The dissolution of gold in the copper ammonium and thiosulfate solution is an electrochemical process, consisting of an anodic process and a cathodic process, as shown in Equations 1–3.¹



In the cathodic process, $\text{Cu}(\text{NH}_3)_4^{2+}$ was reduced to $\text{Cu}(\text{S}_2\text{O}_3)_2^{3-}$ by $\text{S}_2\text{O}_3^{2-}$ and then oxidized to $\text{Cu}(\text{NH}_3)_4^{2+}$ by oxygen. Cu(II) was used as an effective oxidant in gold dissolution by carrying out the above two processes through a continuous cycle, as shown in Figure 1.

The role of copper ions in the gold leaching system of thiosulfate is complex. Cu^{2+} was included in the thiosulfate oxidation mechanism and thiosulfate may be

RESEARCH ARTICLE

Experimental and theoretical investigation of molecular interaction and molecular polarity of organic solvent with ionic liquids and deep eutectic solvents at T (298.15–343.15) K and 1 atm

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Abstract

Densities of the binary mixtures of organic solvents (acetic acid (HAc), n-butanol (n-BuOH) and n-butyl acetate (n-BuAc)) with 1-ethyl-3-methylimidazolium hydrogen sulphate {[EMIM][HSO₄]: **IL**₁}, 1-ethyl-3-methylimidazolium ethyl sulphate {[EMIM][EtSO₄]: **IL**₂}, 1-butyl-3-methylimidazolium acetate {[BMIM][OAc]: **IL**₃}, 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl)imide, {[BMIM][NtF₂]: **IL**₄} and/or Deep Eutectic Solvents (DESs) {choline chloride-acetic acid [ChCl][AA]: **DES**₁}, choline chloride-glycerol [ChCl][Gly]: **DES**₂}, were measured over the entire composition range at T (293.15–343.15) K and 1 atm. The volumetric properties and derived thermodynamic properties of mixed solvents were calculated from the experimental data in order to understand the specific interactions and/or non-specific interactions between mixed solvents during mixing at 298.15 K and 1 atm. Further, the molecular polarity of all the studied components were analyzed using COSMO-RS model.

KEYWORDS

COSMO-RS Model, Deep Eutectic Solvent, Density, Ionic Liquid, Organic Solvent, Volumetric Property

1 | INTRODUCTION

The current conventional esterification process produced minimum six azeotropic mixtures and therefore its very difficult to separate pure butylacetate from their azeotropic mixtures, even operating at high temperature and an elevated pressure. Therefore, the development of low-cost green catalyst media for the green esterification process without forming azeotropic mixtures at 298.15 K and 1 atm are the highly challenging to the researcher and academic peoples. In recent years, ionic liquids (ILs) have gained increasing attention in separation process due to their unique properties including high

thermal stabilities, non-flammability and extremely low vapour pressures, miscibility with other solvents, solubility of gases, partition coefficients of solutes between ionic liquid and aqueous phase.^{1–7} In addition, its possible to modify their chemical structure as per the process requirement. On the other hand, deep eutectic solvents (DES's) also have evolved in the recent decade, with analog properties as that of ILs. ILs and DES's has been studied in gas dissolution, separation, organic material synthesis and storage.⁸ To design any green chemical process and/or reaction involving ILs and DESs on an industrial scale, it is necessary to know chemical – physical properties such as the