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13th Joint Conference on Chemistry (13th JCC)

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7-8 September 2018
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13th Joint Conference on Chemistry

7-8 September 2018

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Preface

On behalf of the Consortium of Chemistry Department in Central Java, Indonesia and the JCC Committee, I would like to thank you for your participation in the 13th Joint Conference on Chemistry which to be held from 7-8th September 2018 in Semarang, Indonesia. The Joint Conference on Chemistry is an annual conference organized by the consortium of Chemistry Department of five universities in Central Java: Diponegoro University (UNDIP), State University of Semarang (UNNES), Sebelas Maret University (UNS), Jenderal Soedirman University (UNSOED) and Satya Wacana Christian University (UKSW). The JCC has been held since 2006.

This conference provides an interactive international forum to provide for sharing and exchange information on the latest research on Chemistry and related sciences, to enhance the capacities for creating innovation system, to contribute in the formulation of global strategies in advancing science role as well as developing policy initiatives in community, to stimulate future collaborations among industries, researchers, governments and other stakeholders who apply science and technology for better live. The speakers and participants of the 13th JCC are up to 250 coming from various countries extending from Indonesia, Malaysia, Philippine, Australia, South Korea, Japan, Iran, Nigeria, UK and India.

We received nearly 200 papers submitted to be included in the proceedings of this conference and after the review and revision process we finally got 158 papers to be published

I would like to thank for the endeavour of committee from Chemistry Department - UNDIP and the consortium member. In addition, the conference committee acknowledges the technical and financial support from Diponegoro University.

Adi Darmawan, Ph.D

The Chair of 13th Joint Conference of Chemistry

Chemistry Department, Faculty of Science and Mathematics, Diponegoro University

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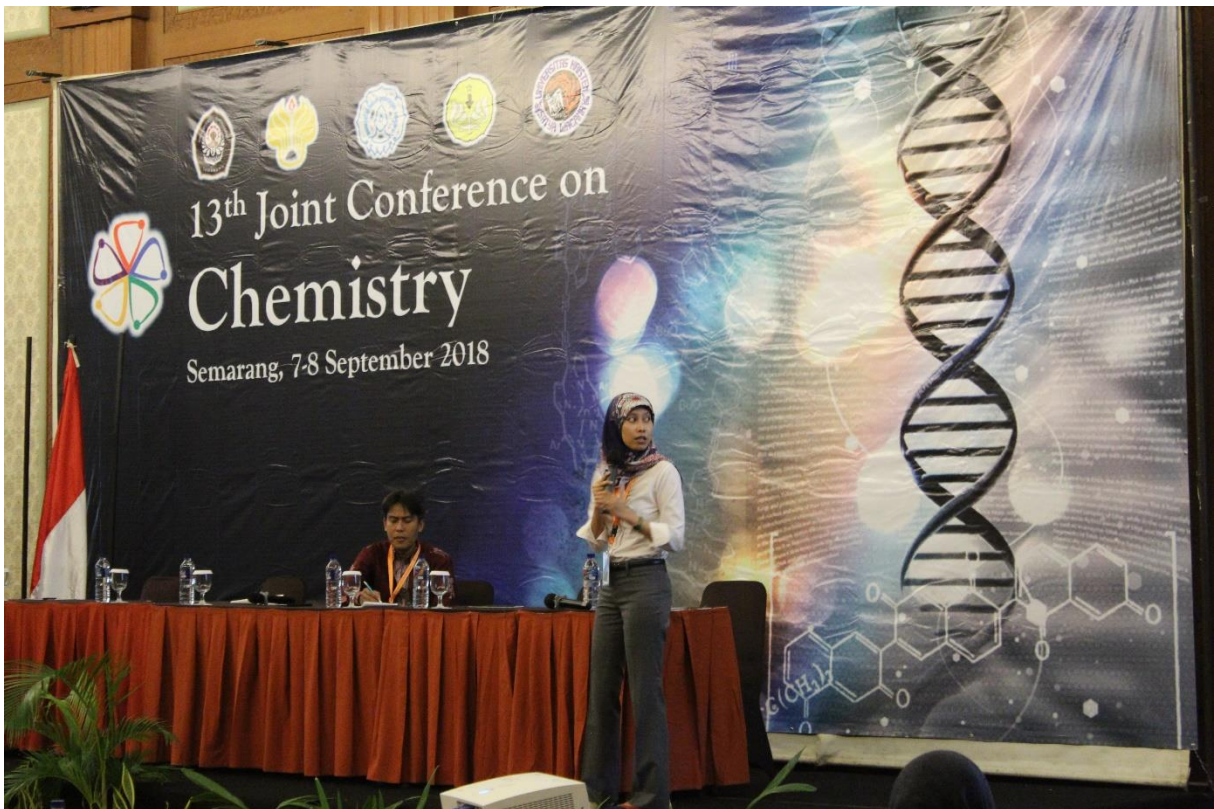
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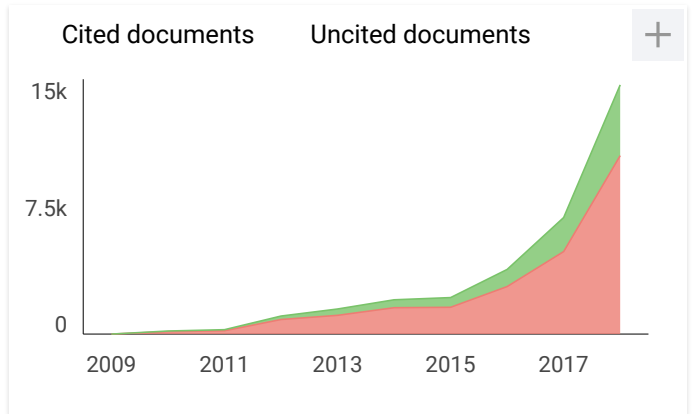
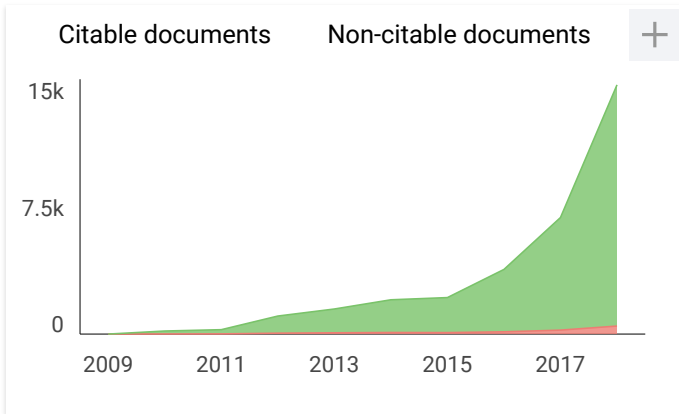
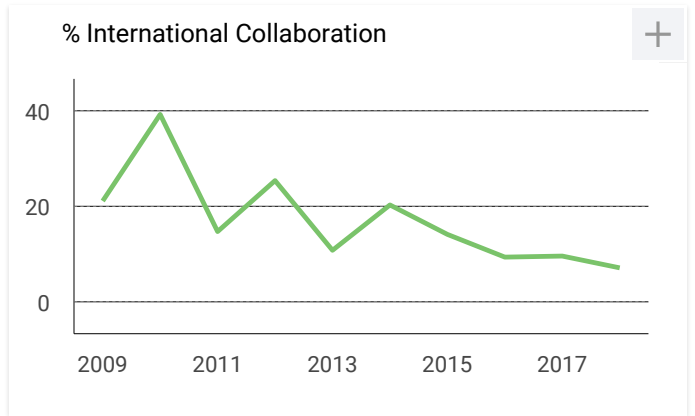
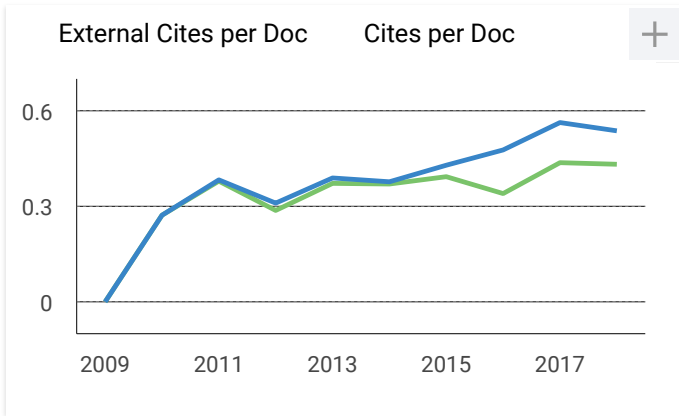
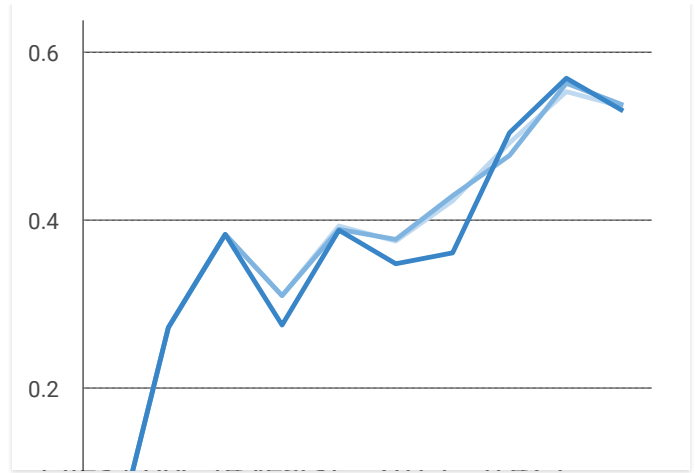
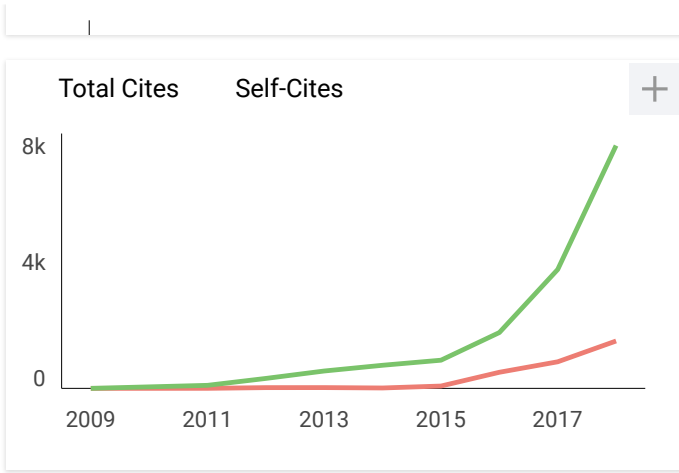
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Mesostructured cellular foam MCF-(9.2T-3D) silica as support for free α -amylase in liquefaction of tapioca starch

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Mesostructured cellular foam MCF-(9.2T-3D) silica as support for free α -amylase in liquefaction of tapioca starch

Joni Agustian^{1,a}, Lilis Hermida^{1,b}

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Abstract. As ethanol can be made from insoluble starches, liquefaction of tapioca using α -amylase immobilised on MCF-(9.2T-3D) silica is studied to observe characteristics of the process. The free α -amylase SQzyme BAP was immobilised on the support via adsorption. During immobilisation, temperature and agitation speed showed low effects on the process, but pH of buffer solution affected the process highly. The optimum enzyme immobilisation occurred at the temperature of 50°C, pH 6 and speed of 60-100 rpm giving the immobilisation efficiency of more than 80%. Liquefaction of the insoluble starch (tapioca) was conducted with the immobilised α -amylase. The maximum result of \pm 50% DE was obtained. The experimental factors of buffer pH, temperature and agitation speed changed the DE significantly, but concentration of immobilised enzyme and substrate affected the process lowly. The optimum pH, agitation speed, immobilised enzyme concentration and temperature were 6, 100 rpm, 84.8 U and 80°C, respectively.

Keywords: α -amylase, MCF (9.2T-3D) silica, Enzyme immobilisation, Tapioca starch, Hydrolysis

1. Introduction

Liquefaction of polysaccharides in ethanol production from starches using free α -amylase is frequently difficult to recover and to recycle the free enzyme back to the process, so that immobilisation of free α -amylase onto inert supports is developed highly. The enzyme can be immobilised via adsorption, covalent bonding, entrapment and cross-linking onto magnetic nanoparticles, polyvinyl alcohol, polyglycidylmethacrylate, Fuller mineral, polyaniline, carboxymethyl cellulose-gelatine [1-8].

One of the useful supports for free α -amylase is silica-based materials. For example is silica-coated nanoparticles had been applied in hydrolysis of soluble starches where the immobilised α -amylase produced better enzymatic activity than the free enzyme [9, 10]. The encapsulated α -amylase by mesoporous silica showed higher thermal stability than its free form in soluble starch hydrolysis [11]. Free α -amylase immobilised onto mesoporous cellular foam (MCF) silicas (MCF-135 and MCF-335) had converted soluble starch to maltose where the covalently bond immobilised α -amylase had 80% of the free enzyme activity [12]. However, the immobilised α -amylase on these supports were merely used to hydrolyze the soluble starchy materials.

As ethanol can be prepared not only from soluble starches but also from insoluble starches such as cassava or tapioca, a study on liquefaction of the tapioca using the α -amylase immobilised on a siliceous support is required in order to observe characteristics of this process. Therefore, this paper describes immobilisation of the free α -amylase SQzyme BAP on MCF-(9.2T-3D), a new type of the MCF silicas



having similar characteristics with the MCF-335, and the enzymatic hydrolysis of tapioca starch using this immobilised enzyme.

2. Experimental Section

2.1. Materials

The main chemicals were bought from Sigma Aldrich (Pluronic® P123 (435465); trimethylbenzene, >98%; tetraethoxysilane, >99%; CH₃COONa) and Merck (NH₄F, >98%; hydrochloric acid, 37%; Na₂HPO₄·12H₂O, >99%; dextrose monohydrate, >99%; KH₂PO₄, >99%). α-amylase (SQzyme BAP; 4,000 U/g) and tapioca flour were provided by local importers.

2.2. Synthesis and characterization of MCF silica

The procedure as developed by Hermida *et al.* [13] was followed.

2.3. Immobilisation process

Immobilisation was conducted via adsorption of free α-amylase (1-3 mg mL⁻¹) dissolved in Sorensen buffer 100 mM (pH of 5-7) on/in 500 mg support. The mixture was shaken Medline BS-31 shaker at the required speed and temperature (60-140 rpm and 30-55°C) for 5 hours. The mixture was then filtered where the filtrate was analyzed for its protein content. The formed residue was rinsed with buffer (3x50 mL) according to the process pH. The immobilised enzyme was dried at 35°C overnight and then put in desiccator. Filtrates collected from the rinsing process were also determined their protein contents. The immobilised α-amylase was calculated using equation 1 and 2 [14-16] :

$$\text{Immobilised Enzyme (\%)} = \frac{(C_0 - C_t)}{C_0} \times V \times 100 \quad (1)$$

$$q = \frac{(C_0 - C_t) \times V}{W} \quad (2)$$

C₀ and C_t are initial and final free enzyme concentration (mg mL⁻¹), V is reactor volume (mL), q is amount of enzyme onto the support (mg g⁻¹) and W is weight of support (g).

2.4. Batch studies on hydrolysis of tapioca starch using immobilized α-amylase

CH₃COONa (30 mL, 100 mM, pH 5-7) was pipetted into some 100 mL flasks. Tapioca starch (3-20 mg mL⁻¹) was then added in. Immobilised α-amylase (42.4-254.4 U) was put into the solution to start the hydrolysis process. The mixture was shaken in water bath at various speeds (100-160 rpm) and temperatures (50-80°C) for 24 hours. Samples were collected at certain interval times and observed their dextrose equivalent (DE).

2.5. Estimation of protein and glucose

To calculate the protein content, Pierce™ BCA protein kit was used, whilst hydrolysis of starch to glucose was determined by DNS (dinitrosalicylic acid) method. Both observations were estimated using the Shimadzu UV-VIS 1800 spectrometer.

2.6. Characterization of immobilized α-amylase using FTIR, SEM and EDX

Nitrogen adsorption-desorption isotherm data were obtained using a Quanta-chrome Autosorb 1C automated gas sorption analyzer operated at liquid nitrogen temperature to estimate average cell pore size, average window pore size, specific pore volume and specific surface area (S_{BET}). Average cell pore size was evaluated using Barrett-Joyner-Halenda (BJH) method from the adsorption branch of the isotherm data. Average window pore size was evaluated using BJH method from the desorption branch. S_{BET} was calculated using Brunauer-Emmett-Teller (BET) method. Samples (support and enzyme) were analyzed using Zeiss EVO field emission scanning electron microscope (SEM), equipped with an Oxford INCAx act, energy dispersive X-ray (EDX) microanalysis system, to obtain SEM images and chemical compositions. Samples were evaluated by Frontier Perkin Elmer FTIR.

3. Results and Discussions

3.1. Characterization of support

Textural properties of MCF silica (9.2T-3D) based on nitrogen adsorption-desorption analysis are shown in **Table 1** and **Fig. 1**. Average pore size and specific surface area (S_{BET}) were evaluated using BET method. Total pore volume (V_{pore} , $\text{cm}^3 \text{g}^{-1}$) was calculated as amount of nitrogen adsorbed at $P/P_0 = 0.98992$. The average window pores and cell sizes were 158 Å and 235 Å, respectively, confirming the mesoporous structure of the silica. The window pores and cell sizes should allow favorable conditions for access and immobilization of α -amylase enzyme due to the enzyme size (~ 40 Å) is lower than the support size.

Table 1. Nitrogen adsorption-desorption result.

S_{BET} (m^2/g)	V_{pore} (cm^3/g)	d_{cell} (Å)	d_{window} (Å)
378	2.12	235	158

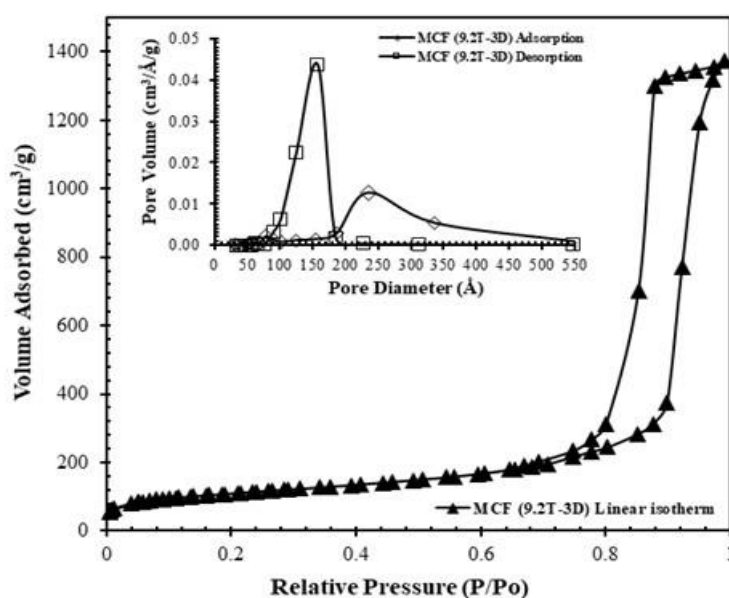


Figure 1. N_2 adsorption/desorption isotherms and pore size distribution plots (inset).

3.2. Characterization of immobilized enzyme using SEM, EDS and FTIR

Adsorption of the enzyme onto the support was firstly confirmed by SEM. **Fig. 2** shows images of MCF silica (9.2T-3D) and immobilized α -amylase. **Fig. 2-A** indicates that the support was in the form of spherical particles with smooth surfaces. Immobilization of α -amylase on the support resulted in rough surfaces on the particles (**Fig. 2-B**). Such morphological changes could be due to organic materials of the α -amylase that was adsorbed by the support.

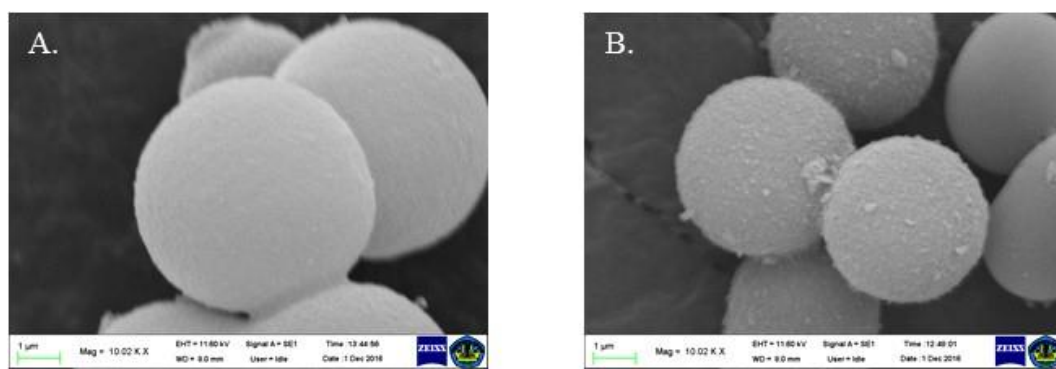


Figure 2. SEM images: **A.** MCF (9.2T-3D) silica, **B.** α -amylase on MCF (9.2T-3D) silica.

The adsorption of enzyme on the support was then observed with FT-IR (**Fig. 3**). FT-IR spectrum of the support showed its vibrations at around $1,062$ - $1,260$ cm^{-1} and 804 cm^{-1} to indicate Si–O–Si stretching vibrations. These vibrations were observed as well on the immobilised α -amylase spectrum. An additional vibration at 2260 cm^{-1} was found on the immobilized enzyme, which was not noticed in the support spectrum. The vibration at 2260 cm^{-1} confirmed C \equiv N or C \equiv C bounds (Baiz et al., 2013). As α -amylase is a protein consisting of a single polypeptide chain of amino acids, this vibration indicated the presence of amino acid structures on the support. EDX analysis was conducted on the support and immobilized α -amylase where both materials were initially coated with high pure gold (**Fig. 4**). The results verified that the support contained Si and O elements at 7.5 keV and 3.5 keV, respectively. The spectrum of the immobilized α -amylase showed elements of C and K besides Si and O. Both spectra indicated successfulness of α -amylase immobilization on MCF silica (9.2T-3D).

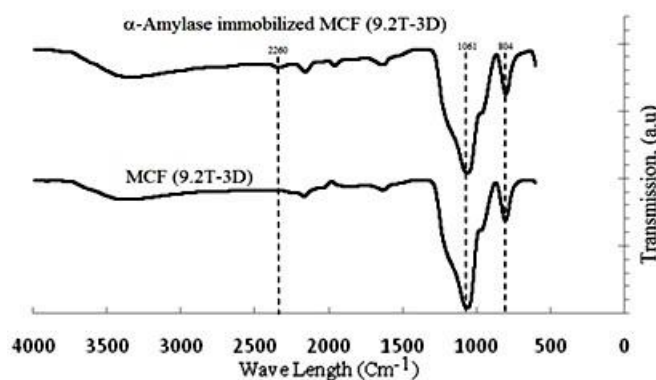


Figure 3. FTIR spectra of support and immobilized enzyme.

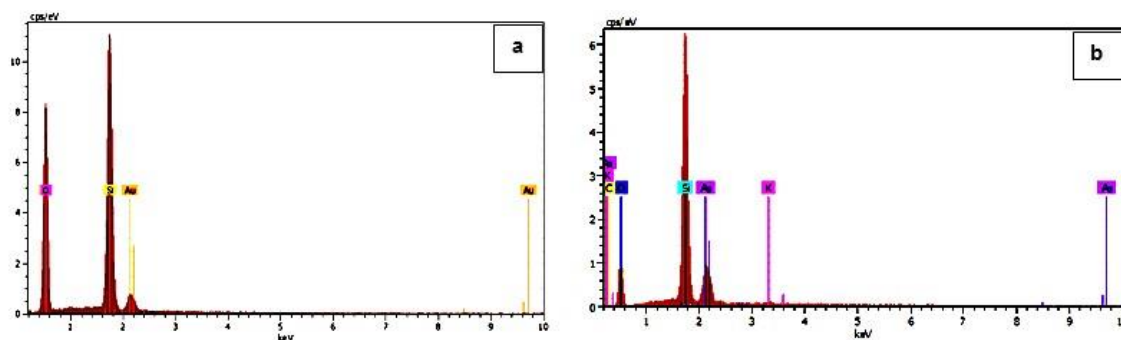


Figure 4. EDX spectra: a) Support, b) immobilized enzyme.

3.3. Immobilisation of enzyme

Immobilisation efficiencies and enzyme loadings are given in Table 2. 4 (four) factors were studied during the immobilisation, which included temperature, agitation speed, buffer pH and initial enzyme concentration. High effect on the immobilisation process was developed by pH of buffer solution. The optimum efficiency of the process was achieved at pH 6.0 where 94.45% (113.34 mg g⁻¹) of free α -amylase was adsorbed by the support. Other operational pH tended to decrease the efficiency significantly. In these experiments, the initial free enzyme concentration as high as 2.5 mg mL⁻¹ could be used as more than 90% free enzyme were immobilised, which indicated that the immobilisation of free α -amylase SQzyme-BAP on the support.

Effect of temperature was considered low. The efficiencies were in the range of 75.49-84.88% where the highest and lowest value were obtained at temperature of 30°C and 50°C, respectively. The optimum temperature could be set at the temperature of 45-55°C as they gave more than 80% immobilised enzyme with < 5% difference. It was a little higher than the previous observations. Temperature of 40°C was used in the immobilisation of α -amylase on carboxymethyl cellulose-gelatine-silica nano-hybrid support [4]. Many immobilisation processes of α -amylase on organic-based or magnetite materials via covalent bonds occurred at 25-35°C [2, 5, 9, 17-21]. Strong supports of MCF silica occurred at high adsorption temperatures that could be caused by the silanols (-OH) are easier to attached by the enzyme.

Table 2. Immobilization efficiency and enzyme loading

Operational Factors	Immobilisation Efficiency (%)	Enzyme Loading (mg g ⁻¹)
Temperature ^a	30°C	75.49
	35°C	79.59
	40°C	77.41
	45°C	81.05
	50°C	84.88
	55°C	83.60
Agitation Speed ^b	60 rpm	83.38
	80 rpm	83.79
	100 rpm	84.88
	120 rpm	80.97
	140 rpm	82.29
Buffer pH ^c	5.0	74.59
	5.5	84.88
	6.0	94.45
	6.5	80.10
Enzyme Concentration ^d	7.0	83.38
	1.0 mg mL ⁻¹	96.98
	1.5 mg mL ⁻¹	97.64
	2.0 mg mL ⁻¹	94.72
	2.5 mg mL ⁻¹	93.59
	3.0 mg mL ⁻¹	88.54

Conditions: ^a: agitation speed = 100 rpm, Sorensen PO₄ buffer = 100 mM pH 5.5, enzyme concentration = 2 mg mL⁻¹; ^b: temperature = 50°C, Sorensen PO₄ buffer = 100 mM pH 5.5, enzyme concentration = 2 mg mL⁻¹; ^c: temperature = 50°C, agitation speed = 100 rpm, enzyme concentration = 2 mg mL⁻¹; ^d: temperature = 50°C, agitation speed = 100 rpm, buffer solution = 100 mM pH 6

A low effect of agitation speed on immobilisation was considered. Although more than 80% of free α -amylase was immobilised when agitation speed was varied (60-140 rpm), the results differed slightly with each other. The agitation could be run at the speed of 60-100 rpm, though the speeds of > 80 rpm also gave good efficiencies, but it is not required to operate the process using high speeds. Relatively low agitation speeds were used to adsorb free α -amylase on MCF silica with high immobilisation efficiencies. Wang *et al.* [22] used agitation speed of 150 rpm to obtain 75% immobilised α -amylase on polystyrene pellets with pentaethylenhexamine and pentaethyleneglycol spacers. Beyler-Çiğil *et al.* [21] obtained 570.9 mg immobilised enzyme from 2,000 mg initial free enzyme at speed of 200 rpm on after 12 hours immobilisation process.

3.4. The enzymatic hydrolysis of tapioca starch

Effects of buffer pH and initial enzyme concentration during the enzymatic hydrolysis process are shown in **Fig. 5-a**. The effect caused by pH of sodium acetate was considered high as Dextrose Equivalent (DE) differed highly (i.e. 22.75-51.16%) where the highest value was found at pH 6.0. However, there is only a small DE difference between the sodium acetate buffer pH 6.0 and 6.5 (i.e. < 3%), so that the buffer pH in the range of 6.0-6.5 could be operated. The optimum pH followed previous observations where the activities were optimized at pH of 6-6.5 [2, 9, 12]. Compared with free α -amylase, the immobilized enzyme showed higher activities (DE) at buffer pH of ≥ 6.5 , however, it had a little lower activity at its optimum pH than free enzyme where 93% of the hydrolytic activity was maintained after immobilisation, which closed to original α -amylase activity (free enzyme). In contrast, the immobilised α -amylase concentration had relatively a low effect on the enzyme activity. An increase trend was observed when quantity of the enzyme was varied in the range of 42.4-254.4 U to give 41.99-51.16% DE. The highest and lowest DE were obtained at 84.8 U and 42.4 U, respectively. The enzyme concentrations of > 84.8 U produced slightly lower DE values, though the number of immobilised enzyme had been three or four times higher after 24 hours observation indicating that maximum reaction velocity was achieved at a lower immobilised enzyme concentration. Compared with free α -amylase activities, the immobilised enzyme performed lower enzymatic activities. At the optimum concentration, the immobilised type produced as high as 93% enzyme activity, which was lower than the free type.

Fig. 5-b describes effects of temperature and agitation speed on tapioca hydrolysis. At various hydrolysis temperatures, their effect on the process was low at high operational temperatures ($\geq 60^\circ\text{C}$). DE values were 26.99-52.06% where the highest DE was obtained at 80°C . DE value was doubled when temperature was changed from 50°C to 60°C , which indicated high effect occurred at low operational temperature(s). Though the highest result was obtained at 80°C , the temperature of 60°C gave DE value of 51.55%, which closed to the highest DE. Hence, the operating temperature could be operated at 60°C as high temperatures only produced a small increase. The free α -amylase achieved its optimum DE at 60°C (57.52%). Although the immobilised α -amylase had relatively lower activity than the free type ($\pm 90\%$ original activity), it had better thermal stability as it still retained high activity at high hydrolysis temperatures. This could be caused by free enzyme is connected to a surface of solid in a multipoint way [18]. The optimum temperatures for enzymatic starch hydrolysis using α -amylase immobilised on various supports were found in the range of 60 - 80°C [2, 19, 21]. Agitation speed had high effect on the immobilised α -amylase performance. The DE values were 35.10-51.55% where the highest and lowest DE were given by speed of 140 rpm and 100 rpm, respectively. The free α -amylase reached the optimum speed the same as the immobilised type. Compared with the free enzyme, the immobilised α -amylase showed $\pm 90\%$ the original activity.

Factor of tapioca starch concentration had low effect on the immobilised α -amylase performance (**Fig. 5-c**) as the difference between the highest and lowest DE was only $\pm 6\%$. Variation on the factor gave DE in the range of 46.0-52.1%. The highest result was obtained at 3% (w/v) starch concentration; however, it was slightly higher than DE produced by the concentration of 5% (w/v) and 8% (w/v). Hence, the enzymatic hydrolysis process could be run at the range concentration of 3-8% in order to get 50% DE. Singh and Ahmad [4], Sohrabi *et al.* [9] and Swarnalatha *et al.* [20] found that activity of

immobilised α -amylase was almost unchanged at high starch concentrations, though the concentrations were increased. Activities of α -amylase immobilised on silica materials were almost linear at starch concentration of $> 10 \text{ mg mL}^{-1}$ [12]. High activity of the α -amylase immobilised on various supports occurred at low starch concentrations [12, 23, 24]. Compared with free α -amylase, the immobilised enzyme only had as high as 90% the original activity.

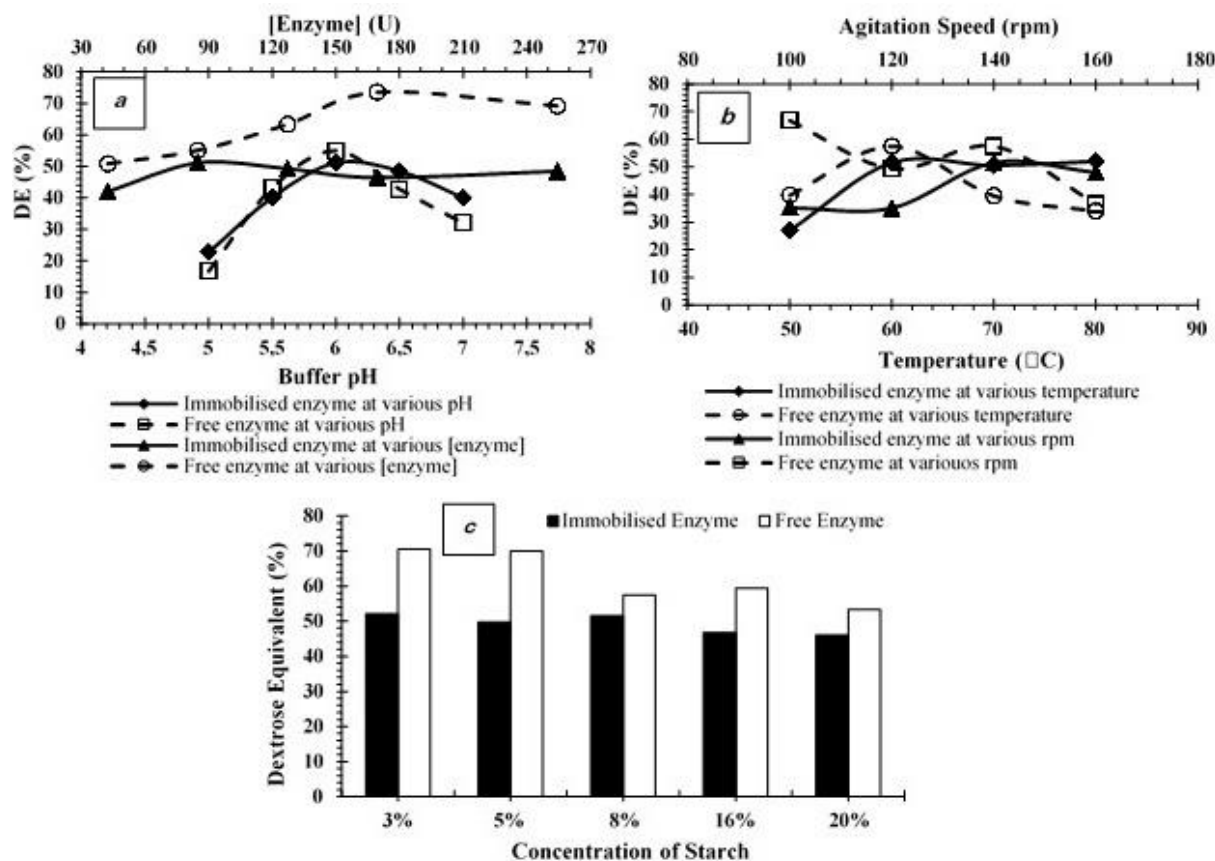


Figure 5. Effects of hydrolysis parameters: *a*) pH and enzyme concentration (pH: 60°C, 140 rpm, 3 mg mL⁻¹ starch, 84.8 U enzyme; enzyme: 60°C, 140 rpm, buffer pH 6, 3 mg mL⁻¹ starch; 24 hours); *b*) temperature and agitation speed (temperature: 8 mg mL⁻¹, 140 rpm, buffer pH 6, 84.8 U enzyme; agitation speed: 60°C, 8 mg mL⁻¹, buffer pH 6, 84.8 U enzyme; 24 hours); *c*) starch concentration (60°C, 140 rpm, buffer pH 6, 84.8 U enzyme, 24 hours observation).

4. Conclusion

Free α -amylase SQzyme BAP was immobilised successfully on MCF silica (9.2T-3D) with high efficiencies. The product functioned well in hydrolysis of tapioca starch. During the immobilisation process, effects of temperature and agitation speed were low, but pH of media affected this process highly. The optimum temperature, agitation speed and medium pH were found at 50°C, 60-100 rpm and pH, respectively, to give $> 80\%$ efficiency. In tapioca hydrolysis, variation of buffer pH, immobilised enzyme concentration and temperature had high effects on the process, however, the starch concentration affect it lowly. Optimum DE were obtained at pH 6, enzyme of concentration of 84.8 U, temperature of 60-80°C and agitation speed of 100 rpm. The process could operate at starch concentrations of 3-8% (w/v) with $\pm 50\%$ DE.

Acknowledgment

These works were supported by Fundamental Research Grant Scheme provided by Ministry of Research, Technology and Higher Education of Indonesia (No. 76/UN26/8/LPPM/2016). We thank for the financial support given to support these works. We deeply appreciated the SEM-EDX analyses provided by the Integrated Laboratory and Centre of Technology Innovation (UPT LTSIT) Universitas Lampung.

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JONI AGUSTIAN <joni.agustian@eng.unila.ac.id>

Abstract Acceptance Letter

1 message

The 13th Joint Conference on Chemistry

<jcc@live.undip.ac.id>

To: joni.agustian@eng.unila.ac.id

Sat, Jun 23, 2018 at 7:17

PM

Dear Sir/Madam,

Please kindly find the enclosed file of abstract acceptance letter.

Looking forward to seeing you in the venue.

Regards,

Yayuk

Yayuk Astuti

Secretary of the 13th Joint Conference on Chemistry

email: jcc@live.undip.ac.id



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259K



JONI AGUSTIAN <joni.agustian@eng.unila.ac.id>

Final program - the 13th Joint Conference on Chemistry

1 message

The 13th Joint Conference on Chemistry

<jcc@live.undip.ac.id>

To: joni.agustian@eng.unila.ac.id

Mon, Aug 27, 2018 at 10:30

AM

Dear Bapak Joni Agustian

We would like to notify you some information regarding the 13th Joint Conference on Chemistry. Please note in detail:

1. Conference Program

We have uploaded the conference program details to the conference website. You can get information about your presentation schedule in the program booklet, as well as abstracts from keynote speakers and presenters. The program is final hence we cannot serve requests for changes of the presentation schedule.

2. Preparing posters Guidelines

For participants who will make poster presentations, please prepare a poster in A1 size with a free layout design. The committee provides stick boards and pin for attachment. Please print on a paper instead of Metromedia Technologies (MMT) cloth

3. Full paper submission deadline

For participants who have not sent a full paper for publication, we need to say that the final deadline is 5th September 2018 and there is no further extension. For those who want to revise the manuscripts, we can still receive them until that date. Please use the replace full paper facility in submission site if you want to revise your manuscripts.

4. Open Chemistry and Journal of Renewable Materials

The journal editor of the Open Chemistry and the Journal of Renewable Materials requested that the submission should be carried out directly by the author and not by the 13th JCC organizer. For this reason, for submission in Open Chemistry and Journal of Renewable Materials, please inform us as the committee hence we can organise with the journal editors. Keep in mind that there is an additional fee of € 260 for each paper accepted at Open Chemistry. For authors who will submit their papers to JRM, please ensure that your manuscripts is in accordance with the scope of the journal

5. Workshop on Materials

Accompanying the 13th JCC there is a Workshop on Materials which will be held on

Thursday, 6th September 2018 from 08.00 WIB - 15.00 WIB at the ICT Center - Diponegoro University. For participants who at the time of registration have not clicked to attend the workshop, you can attend the workshop by filling out the link listed at the workshop flyer attached in this email.

6. Sending the presentation files

To facilitate the organization of presentations, please upload your presentation files via submission site in the form of ppt, pptx or PDF. We have prepared a feature to upload presentation files there. This feature only appears if you have uploaded your full papers

7. Three minutes of presentation

For poster presenters, the best poster selection will be held. Five presenters with the highest scores based on jury and participant input, will be asked to present the results of their research within 3 minutes. Five presenters will get awards

8. Special price in Santika Premiere Hotel for the 13th JCC participants

Hotel Santika Premiere provides special prices for participants of the 13th JCC at a price of Rp.550,000 / nett for Deluxe Room. Please book directly to Santika Premiere Hotel by contacting Mr. Wahyu Pramudito for reservation. Email: wahyupramudito@semarangpremiere.santika.com or +62 856-0037-5438. Please quote that you are the participant of the 13th Joint Conference on Chemistry, 7-8th September 2018 in your communication with him

9. Conference Dinner

A conference dinner will be held on Friday, 7 September 2018 at the Santika Premiere Hotel Ballroom. We invite all participants to attend

10. Trip to Borobudur

On Saturday, 9th September 2018, a trip to Borobudur will be held and some other tourist sites. This excursion will be reserved for keynote speakers and participants who have registered.

Regards

Adi Darmawan

Chair of the 13th Joint Conference on Chemistry

email: jcc@live.undip.ac.id





JONI AGUSTIAN <joni.agustian@eng.unila.ac.id>

Review results for your paper - 13th JCC

3 messages

The 13th Joint Conference on Chemistry

Thu, Oct 11, 2018 at 11:33

<jcc@live.undip.ac.id>

AM

To: JCC - Joni Agustian <joni.agustian@eng.unila.ac.id>

Dear **Bapak Joni Agustian**

Herewith, we send the feedback from reviewers. Please revise your paper according to feedback from the reviewers and email it back to us no later than 1 week from now.

Regards

Adi Darmawan

Chair of the 13th Joint Conference on Chemistry

email: jcc@live.undip.ac.id

 [The 13th Joint Conference on Chemistry](#)

5 attachments

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3194K

JONI AGUSTIAN <joni.agustian@eng.unila.ac.id>

Mon, Nov 5, 2018 at 6:11 AM

To: jcc@live.undip.ac.id

Dear Dr. Adi Darmawan,

Please find on the attached documents, the rebuttal and revised manuscript.

Thank you for your kind attention.

We hope it will bring a good result.

Sincerely yours,

Dr. Joni Agustian, M.Sc.
Department of Chemical Engineering, Universitas Lampung
Lampung - Indonesia

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2 attachments

 **Joni Agustian JOC 02 FINAL.docx**
3253K

 **Answers to reviewers 01.docx**
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The 13th Joint Conference on Chemistry

Tue, Nov 6, 2018 at 2:08

<jcc@live.undip.ac.id>

PM

To: JCC - Joni Agustian <joni.agustian@eng.unila.ac.id>

Dear Bapak Joni Agustian

Thank you for sending us the revised manuscript

Regards

Adi Darmawan

Chair of the 13th Joint Conference on Chemistry

email: jcc@live.undip.ac.id

 [The 13th Joint Conference on Chemistry](#)

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JONI AGUSTIAN <joni.agustian@eng.unila.ac.id>

13th JCC proceeding has been published

1 message

The 13th Joint Conference on Chemistry

<jcc@live.undip.ac.id>

Mon, May 6, 2019 at 11:15

AM

To: JCC - Joni Agustian <joni.agustian@eng.unila.ac.id>

Dear **Bapak Joni Agustian**

We hereby inform you that the proceeding of the 13th Joint Conference on Chemistry which held on September 7-8, 2018 in Semarang has been published in the IOP Conference series: Materials Science and Engineering volume 509.

<https://iopscience.iop.org/issue/1757-899X/509/1>

We apologize for the delay in publishing this proceeding for up to eight months from the conference day. We received 175 articles and after the review and revision process, finally there are 158 articles published. The review process ran for four months, two months for layouting and the production process in IOP itself for two months.

We thank you for your participation in the 13th Joint Conference on Chemistry in Semarang, and we hope you will also attend the next JCC series, the 14th Joint Conference on Chemistry to be held September 10-11, 2019 in Surakarta Indonesia. The 14th JCC website is <https://jcc.uns.ac.id/>

Regards

Adi Darmawan

Chair of the 13th Joint Conference on Chemistry

email: jcc@live.undip.ac.id