**BUKTI KORESPONDENSI ARTIKEL PADA JURNAL INTERNASIONAL BEREPUTASI**

PENGUSUL: Samsudin Anis, S.T., M.T., Ph.D.

JUDUL ARTIKEL:

Microwave-assisted pyrolysis and distillation of cooking oils for liquid bio-fuel production

Publikasi

| | | |
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Kepada Yth.

Tim Penilai Usulan PAK

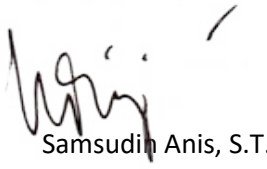
Bersama ini kami sertakan bukti korespondensi dan proses review artikel kami berjudul "Microwave-assisted pyrolysis and distillation of cooking oils for liquid bio-fuel production" dipublikasikan di Journal of Analytical and Applied Pyrolysis Vol 154 bulan Maret tahun 2021 tanggal publikasi online 30 Desember 2020.

Resume Kronologi

| No | Tanggal | Aktivitas |
|---|---|---|
| 1 | 23 Maret 2020 | Submit artikel |
| 2 | 15 April 2020 | Mendapatkan hasil review yang pertama |
| 3 | 16 Mei 2020 | Submit artikel yang telah direvisi |
| 4 | 14 Juli 2020 | Mendapatkan hasil review yang kedua |
| 5 | 16 Oktober 2020 | Submit artikel yang telah direvisi |
| 6 | 26 Desember 2020 | Artikel dinyatakan diterima |
| 7 | 30 Desember 2020 | Artikel terpublikasi online |

Demikian atas perhatian Bapak/Ibu, saya mengucapkan terima kasih

Semarang, 29 November 2022



Samsudin Anis, S.T., M.T., Ph.D.

**Korespondensi I**

Your manuscript, JAAP_2020_210, has not been accepted External Inbox ×

**Mark Nimlos (Journal of Analytical and Applied Pyrolysis)** <EviseSupport@elsevier.com> Wed, Apr 15, 2020, 10:23 PM

to me

Ref: JAAP_2020_210
Title: Microwave-enhanced pyrolysis and distillation of cooking oils for bio-fuel production
Journal: Journal of Analytical and Applied Pyrolysis

Dear Dr. Anis,

Thank you for submitting your manuscript to Journal of Analytical and Applied Pyrolysis. I regret to inform you that your paper is not acceptable for publication. We have completed the review of your manuscript and a summary is appended below. The reviewers have advised against publication of your manuscript and I must therefore reject it at this time. For your information and guidance, any specific comments explaining why I have reached this decision and those received from reviewers, if available, are listed at the end of this letter.

You have the option of resubmitting a substantially revised version of your paper, which would be considered as a new submission. If you decide to do this, you should refer to the reference number of the current paper and include a cover letter which explains in detail how the paper has been changed or not, in reply to the Editor and Reviewer comments.

Thank you for giving us the opportunity to consider your work.

Kind regards,

Dr. Nimlos
Editor
Journal of Analytical and Applied Pyrolysis

**Comments from the editors and reviewers:**

**-Reviewer 1**

-

The results are interesting, and the contribution is adequate. Some minor corrections are needed. Reviewer comments are as following:

General comments:

Proof reading is needed to correct some grammar errors and also to improve the writing style. Examples: Page 5 (Prior conducting the experiment); Page 6 (Prior injected the sample)

Methodology:

- -The manipulative variables and constants have to be further clarified including the operating ranges (preferably in the form of table).
- -Your main respond variable is the mass yield. Please include the equation for its calculation.
- -You have determined the calorific value of the products. First, please use the SI units (MJ/kg) and change the name to heating value. And please specify is it HHV or LHV.
- -Since you have the heating value. Please include the energy yield as one of you respond variables since it reveals the economic and practical feasibility of the production process. And also, please include the equation for the calculation.

Results:

- - Please specify the yield or the material (%) in your figures (and tables) as wt%.
- -The title is on bio-fuel production, but no results on the gaseous or solid fuel analysis were shown. I suggest the title be specified to (liquid bio-fuel)

**-Reviewer 2**

- I do not recommend acceptance. Novelty is low, with many (although I did not list here) almost similar works published. The only aspect that is new is the operation was in a continuous mode. If that is the novelty, then by all means, that should be the focus of this study. However, researchers did not investigate the effects of flow rate of feed, the effects of weight-hourly-space-velocity etc. They are not reporting on their Damkohler number. How about the solution itself; does it absorb microwave source for intensification?

I found it appalling that authors claimed in-situ distillation in the microwave reactor. When I looked at the set up, it is located outside the microwave reactor! Furthermore, it is just a normal condenser, not a complex distillation that I would expect of. It further diluted the novelty claim of this work.

In lieu of these comments, I suggest rejection

Date: 16 May 2020

Prof. Mark Nimlos,
Editor Journal of Analytical and Applied Pyrolysis

Dear Prof. Mark Nimlos,

Ref: JAAP_2020_210
Journal: Journal of Analytical and Applied Pyrolysis
MS entitled: Microwave-assisted pyrolysis and distillation of cooking oils for liquid bio-fuel production

I am resubmitting a substantially revised version of manuscript (Ref: JAAP_2020_210) based on the Editor and Reviewers Comments for possible publication in the Journal of Analytical and Applied Pyrolysis. Detail revision point by point could be found in the attachment.

This study offers a proper method of liquid bio-fuels production from longer hydrocarbon chains of waste cooking oil (WCO). This manuscript provides technical information regarding novel approach of continuous microwave-assisted pyrolysis of cooking oils at various feed flow rates and temperatures, and microwave-assisted distillation of pyrolytic bio-oil to obtain green-diesel fraction. The bio-oil chemical composition, properties of green-diesel fraction, and estimates of the energy consumption and recovery that are beneficial for scientists, engineers, and researchers, are also reported in this work.

We revealed that the continuous microwave-assisted pyrolysis provided attractive bio-oil composition and yield. The obtained bio-oil totally composed of aliphatic hydrocarbons and contained more than 50 wt. % of green-diesel which is potential as fuel candidate for diesel engines. Estimates of the energy consumption and energy recovery showed the pyrolysis and distillation of WCO under microwave irradiation provided high energy recovery. Overall, the processes show great potential to be applied in producing high energy content of liquid bio-fuels. The publication of this manuscript will encourage innovation of green-diesel production technology through continuous microwave-assisted pyrolysis and distillation.

Please kindly acknowledge me for the receipt of the manuscript. If you have any inquiries, please do not hesitate to contact me through my email at samsudin_anis@mail.unnes.ac.id. Your cooperation regarding this matter is very much appreciated.
Thank you and with kind regards.

Yours sincerely,

Dr. Samsudin Anis
Department of Mechanical Engineering, Universitas Negeri Semarang, Indonesia
E-mail: samsudin_anis@mail.unnes.ac.id
HP: +6281390157009

The details of the revision are listed point by point as below:

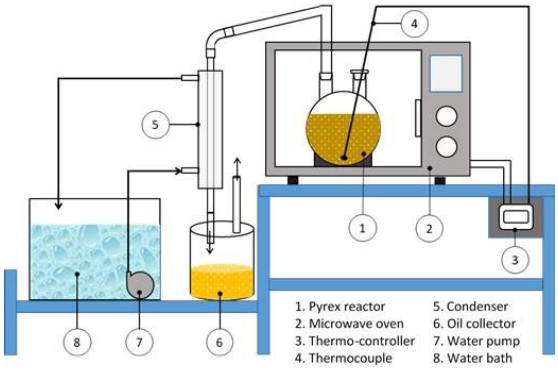
Reviewer #1

<table>
<tr><th>No</th><th>Comment</th><th>Revision</th></tr>
<tr><td>1.</td><td>General comments:<br>Proof reading is needed to correct some grammar errors and also to improve the writing style. Examples: Page 5 (Prior conducting the experiment); Page 6 (Prior injected the sample)</td><td>The manuscript has been revised and improved.<br>Some grammar errors have been corrected and the writing style has been improved.</td></tr>
<tr><td>2.</td><td>Methodology:<br>1) The manipulative variables and constants have to be further clarified including the operating ranges (preferably in the form of table)</td><td>1) The manipulative variables and constants including the operating ranges have been clarified as given in Section 2.3 and Table 1 in the revised manuscript as follows:<br><br>Table 1. Experimental pyrolysis condition<br><table><tr><th>Manipulative variable</th><th>Operating condition</th><th>Constant variable</th><th>Respond variable</th></tr><tr><td>Feed flow rate</td><td>0.051 – 0.306 kg/h</td><td>Temperature: 450 °C<br>Feedstock: WCO<br>Amount of charcoal: 300 g<br>$N_2$ flow rate: 100 ml/min<br>Process duration: 60 min<br>Microwave power: 900 W</td><td>Temperature profile<br>Mass yield of products (bio-oil, gas, solid)</td></tr><tr><td>Temperature</td><td>400 – 550 °C</td><td>Feed flow rate: 0.102 kg/h<br>Feedstock: WCO, FCO<br>Amount of charcoal: 300 g<br>$N_2$ flow rate: 100 ml/min<br>Process duration: 60 min<br>Microwave power: 900 W</td><td>Mass yield of products (bio-oil, gas, solid)<br>Chemical composition of WCO, FCO, bio-oil</td></tr></table></td></tr>
<tr><td></td><td>2) Your main respond variable is the mass yield. Please include the equation for its calculation</td><td>2) The equations for mass yield calculation have been provided in the revised manuscript as given in the third paragraph of Section 2.3 as follows:<br><br>……Evaluation of the yield of products is given in the following equations:<br>$Y_{BO} = \frac{m_{fB} - m_{iB}}{m_O} \times 100\%$ 1)<br>$Y_S = \frac{m_{fS} - m_{iS}}{m_O} \times 100\%$ 2)<br>$Y_G = 100\% - (Y_{BO} + Y_S)$ 3)<br>where $Y_{BO}$, $Y_S$, and $Y_G$ are the yields of bio-oil, solid, and gas products, respectively in wt.%; $m_{fB}$ and $m_{iB}$ are the final and initial weight of the oil collector and condenser, respectively; $m_{fS}$ and $m_{iS}$ are the final and initial weight of the reactor contained charcoal, respectively; while $m_O$ is the total weight of WCO or FCO during the pyrolysis process.</td></tr>
</table>

| No | Comment | Revision |
|---|---|---|
| | 3) You have determined the calorific value of the products. First, please use the SI units (MJ/kg) and change the name to heating value. And please specify is it HHV or LHV | 3) The calorific value in this work refers to the higher heating value (HHV). So, we have revised the manuscript in which the term of calorific value has been changed to HHV and the unit has also been changed to SI units (MJ/kg). |
| | 4) Since you have the heating value. Please include the energy yield as one of you respond variables since it reveals the economic and practical feasibility of the production process. And also, please include the equation for the calculation | 4) The estimates of the energy yield that illustrate the economic and practical feasibility of the production process have been included in the manuscript. The equations for the calculation have also been provided. The estimates of the energy yield cover both pyrolysis and distillation processes as given in **Section 3.5 especially in Tables 7 and 8** in the revised manuscript. |
| 3. | Results:<br>1) Please specify the yield or the material (%) in your figures (and tables) as wt% | 1) We have specified the yield or the material in the figures and tables as wt.% in the revised manuscript. |
| | 2) The title is on bio-fuel production, but no results on the gaseous or solid fuel analysis were shown. I suggest the title be specified to (liquid bio-fuel) | 2) The title has been changed as suggested to become:<br><br>Microwave-assisted pyrolysis and distillation of cooking oils for liquid bio-fuel production |

Reviewer #2

| No | Comment | Revision |
|---|---|---|
| 1. | I do not recommend acceptance. Novelty is low, with many (although I did not list here) almost similar works published. The only aspect that is new is the operation was in a continuous mode. If that is the novelty, then by all means, that should be the focus of this study. However, researchers did not investigate the effects of flow rate of feed, the effects of weight-hourly-space-velocity etc. | The manuscript has been revised and improved as suggested. The effects of flow rate of feed, the effects of weight-hourly-space-velocity (WHSV), and the effects of power load (WHSV/MP) have been investigated in term of both thermal capability of the system and yield of products of the pyrolysis process. The results and discussion of these effects are described in **Section 3.1 and Section 3.2.1** in the revised manuscript. |
| 2. | They are not reporting on their Damkohler number. How about the solution itself; does it absorb microwave source for intensification? | We agreed that Damkohler number is an important factor in reaction process, particularly for evaluation of the mechanism and kinetic reaction of the process. However, this case is beyond the scope of this study. This study focuses on the experimental investigation of the effect of some parameters on pyrolysis of WCO and FCO as well as bio-oil product distillation under microwave irradiation. |
| 3. | I found it appalling that authors claimed in-situ distillation in the microwave reactor. When I looked at | The schematic diagram of the experimental equipment for distillation process is illustrated in **Figure 2 of Section 2.2** in the revised manuscript as follows: |

| No | Comment | Revision |
|---|---|---|
| | the set up, it is located outside the microwave reactor! Furthermore, it is just a normal condenser, not a complex distillation that I would expect of. It further diluted the novelty claim of this work. |  <br>As shown in the figure, **the reactor containing bio-oil and charcoal is located inside the cavity of the microwave oven**. The microwave oven in this work plays a role in transferring energy into the reactor, absorbed by charcoal to heat the bio-oil to separate the compounds according to the desired distillation temperature. The evaporated compounds are then channeled to a low temperature condenser to condense it and then collected and separated.<br>This provides useful information about an attractive simple distillation technique for pyrolytic bio-oil purification with the aid of microwave irradiation. |

## Korespondensi II

Revision requested for JAAP_2020_404 External Inbox ×

**Mark Nimlos (Journal of Analytical and Applied Pyrolysis)** <EviseSupport@elsevier.com> Jul 14, 2020, 11:26 PM
to me

Ref: JAAP_2020_404
Title: Microwave-assisted pyrolysis and distillation of cooking oils for liquid bio-fuel production
Journal: Journal of Analytical and Applied Pyrolysis

Dear Dr. Anis,

Thank you for submitting your manuscript to Journal of Analytical and Applied Pyrolysis. I have completed the review of your manuscript and a summary is appended below. The reviewers recommend reconsideration of your paper following major revision. I invite you to resubmit your manuscript after addressing all reviewer comments.

When resubmitting your manuscript, please carefully consider all issues mentioned in the reviewers' comments, outline every change made point by point, and provide suitable rebuttals for any comments not addressed.

To submit your revised manuscript:

- Log into EVISE® at: http://www.evise.com/evise/faces/pages/navigation/NavController.jspx?JRNL_ACR=JAAP
- Locate your manuscript under the header 'My Submissions that need Revisions' on your 'My Author Tasks' view
- Click on 'Agree to Revise'
- Make the required edits
- Click on 'Complete Submission' to approve

**What happens next?**

After you approve your submission preview you will receive a notification that the submission is complete. To track the status of your paper throughout the editorial process, log in to Evise® at: http://www.evise.com/evise/faces/pages/navigation/NavController.jspx?JRNL_ACR=JAAP.

**Enrich your article to present your research with maximum impact.** This journal supports the following Content Innovations:

I look forward to receiving your revised manuscript as soon as possible.

Kind regards,

Mark Nimlos
Editor
Journal of Analytical and Applied Pyrolysis

**Comments from the editors and reviewers:**

**-Reviewer 1**

-

The article contains some meaningful researches. It conducted continuous pyrolysis of waste oils and explored the effect of feed flow rate, pyrolysis temperature and types of cooking oil on product yield and bio-oil composition.The bio-oil obtained at 450°C was then distilled, and the green-diesel produced by distillation was compared with commercial dies. However, this paper should not be published in the present form. This paper should be published after some major revisions.

Here are some comments that should be addressed before publication:

1. May I ask how to use GC-MS for quantitative analysis?The response value of the instrument to various compounds is different, peak area integral calculation of compound content is not accurate, and in Figure. 7, 8, 9and 10, chromatograms have different levels of baseline migration, it is recommended to change a more accurate quantitative method.
2. Introduction: The research status of microwave pyrolysis of waste oil is too little introduced. It is suggested to add more and enrich the content.
3. The analysis of results is too shallow, as shown in Table 4, which is basically a description of the results, but less analysis. For example, the reason why Alkuna appeared in bio-oil at 500°Cof FCO is not explained, but only the results are described.
4. Used for distillation of bio-oil was pyrolytic oil from WCO cracking at atemperature of 450 °C, and to analyze its distillate fuel properties.In Figure 9 and 10, why choose 500 °C of GC-MS chromatogram, why not use 450 °C？the analysis of the effect of temperature on pyrolysis should combine oil yield and bio-oil quality GC - MS chromatograms of pyrolytic oil temperature of 450 °C, should be focused.
5. In Table 5, the results shown in reference [27] are inconsistent with the description of 1205-1207, and the reason is not explained.
6. It is suggested to increase the reliability of the experimental data through repeated experiments.
7. The icon format is not uniform，such as line 264"Figure 2 "and line230"Fig. 4 ".Please correct these.

**-Reviewer 2**

-

This study produced and characterized the bio-oil from pyrolysis and distillation of waste cooking oil samples in a microwave reactor. The results showed that the product yields and bio-oils composition were strongly influenced by pyrolysis temperature and type of feedstocks, while there was almost no influence of feed flow rate under the investigated condition. The bio-oil produced from waste cooking oil contained more than 50 wt.% green-diesel (C10-C15) indicating the microwave-assisted pyrolysis and distillation processes have potentials to convert problematic waste cooking oil into useful liquid bio-fuel and green-diesel fuel. However, there are still many issues need to be addressed before acceptance:

1. The abstract needs to be condensed.
2. The statement below is confusing. Please rewrite.

"Nevertheless, the use of microwave is largely applied to the transesterification process for bio-oil production. However, inadequate information about WCO processing through microwave-assisted pyrolysis is available in published literature."

3. What are the advantages of pyrolysis compared to transesterification for WCO?
4. Why authors used commercial particulate charcoal as the absorber as there are many kind of absorber material? Please justify.
5. Why thermal capability of the microwave was tested at 450°C only?
6. Fig. 3: Heating up process >> consider revise to >> Heating process
7. Please provide the information of the minimum and maximum temperatures due to temperature fluctuations as shown in Fig. 3.
8. Tables 3 and 4. Put the unit in the table caption for better table presentation
9. Section 3.5. Energy Consumption and Recovery: Please add discussion on $E_{BO}/E_{WCO}$ parameter given in Table 7.
10. Please polish the language carefully.

Date: 16 October 2020

Prof. Mark Nimlos,
Editor Journal of Analytical and Applied Pyrolysis

Dear Prof. Mark Nimlos,

Ref: JAAP_2020_404
Journal: Journal of Analytical and Applied Pyrolysis
MS entitled: Microwave-assisted pyrolysis and distillation of cooking oils for liquid bio-fuel production

I am submitting a revised manuscript (Ref: JAAP_2020_404) based on the Reviewers Comments for possible publication in the Journal of Analytical and Applied Pyrolysis. Detail revision point by point is provided in the response to reviewers files.

Please kindly acknowledge me for the receipt of the manuscript. If you have any inquiries, please do not hesitate to contact me through my email at samsudin_anis@mail.unnes.ac.id. Your cooperation regarding this matter is very much appreciated.
Thank you and with kind regards.

Yours sincerely,

Dr. Samsudin Anis
Department of Mechanical Engineering, Universitas Negeri Semarang, Indonesia
E-mail: samsudin_anis@mail.unnes.ac.id
HP: +6281390157009

The details of the revision are listed point by point as below:

Reviewer #1

The article contains some meaningful researches. It conducted continuous pyrolysis of waste oils and explored the effect of feed flow rate, pyrolysis temperature and types of cooking oil on product yield and bio-oil composition. The bio-oil obtained at 450℃ was then distilled, and the green-diesel produced by distillation was compared with commercial dies. However, this paper should not be published in the present form. This paper should be published after some major revisions.
Here are some comments that should be addressed before publication:

| No | Comment | Revision |
|---|---|---|
| 1. | May I ask how to use GC-MS for quantitative analysis? The response value of the instrument to various compounds is different, peak area integral calculation of compound content is not accurate, and in Figure. 7, 8, 9and 10, chromatograms have different levels of baseline migration, it is recommended to change a more accurate quantitative method. | Thank you very much for the comment and suggestion. "GC-MS has been used for quantitative analysis of the bio oil samples. The content of identified compound was from peak area integral calculation. Identification of the characteristic peaks was carried out by employing NIST MS 2.0 software to compounds spectrum. All the samples were treated and analyzed at similar GC-MS program to obtain good result with accuracy of more than 98% (or less than 2% error) as recommended by the equipment manufacture."<br><br>The above description has been included in the revised manuscript as given in the **first paragraph of Section 2.4**.<br><br>We have checked and scrutinized the GC-MS results carefully with regard to the results given in Figures 7 to 10. The response value of the instrument to various compounds and the accuracy of peak area integral calculation of compound content have been corrected. 1-Heptatriacotanol peak RT shown in Fig. 8 has been corrected to 47.13 min. For other compounds, the response values have been appropriate where shorter carbon chains are detected earlier than longer carbon chains. For example 2-Tridecene ($C_{13}H_{26}$) in Figure 10 was detected earlier at 20.83 min while 1-Tetradecene ($C_{14}H_{28}$) in Figure 9 was at 20.87 min. Likewise; 1-Pentadecene ($C_{15}H_{30}$) in Figure 10 was detected earlier at 23.32 min while 7-Hexadecene, (Z) - ($C_{16}H_{32}$) in Figure 9 was at 23.37 min.<br><br>The levels of baseline migration have also been evaluated. In general, the results provide high accuracy of over 99% (or less than 1% error) that is within the allowable level of accuracy. For examples:<br>a. n-Hexadecanoic acid in Figs. 7 and 8 was detected at 34.04 min and 34.27 min, respectively, indicating an error of 0.67%.<br>b. Trans-13-Octadecenoic acid in Figs. 7 and 8 was detected at 37.17 min and 37.48 min, respectively, indicating an error of 0.83%.<br>c. 1-Tridecene in Figs. 9 and 10 was detected at 18.19 min and 18.15 min, respectively, indicating an error of 0.22%, and<br>d. 2-Heptadecanone in Figs. 9 and 10 was detected at 32.37 min and 32.28 min, respectively, indicating an error of |

| No | Comment | Revision |
|---|---|---|
| | | 0.28%.<br>Based on the fact above, statement below has been included in the revised manuscript as shown in the **first paragraph of Section 3.3.1**.<br><br>….. The results showed that response values and peak identification provided a high accuracy of over 99% (or less than 1% error) that is within the allowable level of accuracy…... |
| 2. | Introduction: The research status of microwave pyrolysis of waste oil is too little introduced. It is suggested to add more and enrich the content. | The research status of microwave pyrolysis of waste oil has been added in the manuscript as suggested. The related information can be found in **the third paragraph of Introduction section** as follows:<br><br>……The literature showed that waste oils derived from engine oil have been successfully converted into useful products under microwave pyrolysis [15,17,18]. However, information regarding WCO processing through microwave-assisted pyrolysis process is rarely available in the published literature. Diesel-like fuel recovery from microwave pyrolysis of waste palm cooking oil has been done [19]. In the study, waste palm cooking oil collected from a fried chicken restaurant was processed under batch microwave pyrolysis for diesel-like fuel recovery at some process parameters such as temperature and type of absorber. A recent study also reported about bio-oil production from WCO at a low temperature of 400$^{o}$C under continuous microwave pyrolysis [20]. |
| 3. | The analysis of results is too shallow, as shown in Table 4, which is basically a description of the results, but less analysis. For example, the reason why Alkuna appeared in bio-oil at 500℃of FCO is not explained, but only the results are described. | Thank you for the comment. We have revised the manuscript as requested as given in **the fourth paragraph of Section 3.3.2** as follows:<br><br>…….The formation of Alkuna is very possible to occur at high temperatures. In the presence of heat, saturated hydrocarbons can eliminate hydrogen gas to form unsaturated hydrocarbons. This means that when saturated hydrocarbons of alkanes or alkenes are heated to high temperatures in absence of air, a mixture of saturated and unsaturated hydrocarbons (e.g. alkenes and alkuna) is formed [27-29]. This condition then caused a reduction in the alkane's content at 500$^{o}$C as shown in Table 4. Other studies suggest that the formation of alkynes can occur at relatively lower temperatures with the aid of catalysts such as silica, alumina or carbonaceous materials [30]…….. |
| 4. | Used for distillation of bio-oil was pyrolytic oil from WCO cracking at a temperature of 450 ℃, and to analyze its distillate fuel properties. In Figure 9 and 10, why choose 500 ℃ of GC-MS chromatogram, why not use 450 ℃？ the analysis of the effect of temperature on pyrolysis should combine oil yield and bio-oil quality GC - MS chromatograms of pyrolytic oil temperature of 450 ℃, should be focused. | This work was conducted and analyzed sequentially as described in **Section 2.3**.<br>Based on the bio oil yield, 500$^{o}$C provided the highest yield of bio oil. So that, it is necessary to analyze its bio-oil composition as given in Figs. 9 and 10, which is then continued by comparing it with the bio-oil composition in other conditions as shown in Table 4 in **Section 3.3.2**.<br>Table 4 shows that although 500$^{o}$C produced higher bio oil yield, the bio-oil contained less green diesel compounds compared to 450$^{o}$C. So that, in view of green diesel production, bio oil produced from WCO at 450$^{o}$C was chosen for further experiments. |

| No | Comment | Revision |
|---|---|---|
| 5. | In Table 5, the results shown in reference [27] are inconsistent with the description of 1205-1207, and the reason is not explained. | The table has been revised and reference [27] has been omitted due to inconsistent fuel category used. In addition, we have added 2 other references in **Table 5** to support the related descriptions.<br><br>The reason has also been provided that can be found in **the third paragraph of Section 3.4** as follows:<br><br>……This showed that microwave irradiation intensity might be contributed in enhancing cracking reactions that could not be attained with conventional heating [17]……. |
| 6. | It is suggested to increase the reliability of the experimental data through repeated experiments. | Thank you for the suggestion. In this work, minimum three times in each experimental parameter were conducted and three samples were taken for obtaining the average. |
| 7. | The icon format is not uniform， such as line 264“Figure 2 ”and line230“Fig. 4 ”.Please correct these. | We have revised and improved the manuscript, so that the referred icon(s) have been corrected. |

The details of the revision are listed point by point as below:

Reviewer #2

This study produced and characterized the bio-oil from pyrolysis and distillation of waste cooking oil samples in a microwave reactor. The results showed that the product yields and bio-oils composition were strongly influenced by pyrolysis temperature and type of feedstocks, while there was almost no influence of feed flow rate under the investigated condition. The bio-oil produced from waste cooking oil contained more than 50 wt.% green-diesel (C10-C15) indicating the microwave-assisted pyrolysis and distillation processes have potentials to convert problematic waste cooking oil into useful liquid bio-fuel and green-diesel fuel. However, there are still many issues need to be addressed before acceptance:

| No | Comment | Revision |
|---|---|---|
| 1. | The abstract needs to be condensed. | The abstract has been condensed as suggested. |
| 2. | The statement below is confusing. Please rewrite. "Nevertheless, the use of microwave is largely applied to the transesterification process for bio-oil production. However, inadequate information about WCO processing through microwave-assisted pyrolysis is available in published literature." | The referred statements have been rewritten that can be found in **the third paragraph of Introduction section** as follows:<br><br>....."In general, the use of microwaves is widely applied to the transesterification process for bio-oil production from liquid waste. Instead of transesterification, the use of microwaves for pyrolysis of liquid waste has also been gained attention in recent years."…… |
| 3. | What are the advantages of pyrolysis compared to transesterification for WCO? | The advantages of pyrolysis compared to transesterification have been included in the revised manuscript as given in **the third paragraph of Introduction section** as follows:<br>….."This is because pyrolysis has several advantages including the flexibility to use various types and compositions of raw materials, and several valuable fuels and chemicals can be produced."…….<br><br>The above statement has been included in the manuscript. |
| 4. | Why authors used commercial particulate charcoal as the absorber as there are many kind of absorber material? Please justify. | ….The charcoal was used in this work as it available commercially and generally has good microwave absorption ability compared to others absorber materials…..<br><br>The above statement has been included in the manuscript as given in **Section 2.1**. |
| 5. | Why thermal capability of the microwave was tested at 450$^{o}$C only? | …..This temperature was chosen because it is widely proven to be a good condition for materials decomposition through pyrolysis process……<br><br>The above statement has been included in the manuscript as shown in the **first paragraph of Section 2.3**. |
| 6. | Fig. 3: Heating up process >> consider revise to >> Heating process | Fig. 3 has been revised. "Heating up process" has been changed to become "Heating process" |
| 7. | Please provide the information of the minimum and maximum temperatures due to temperature fluctuations as shown in Fig. 3. | Information of the minimum and maximum temperatures due to temperature fluctuations as shown in Fig. 3 have been supplied in the **first paragraph of Section 3.1** as follows:<br><br>…..The maximum temperatures at the condition were found |

<table>
<tr><th>No</th><th>Comment</th><th>Revision</th></tr>
<tr><td></td><td></td><td>to be 453ºC, 451ºC, and 450ºC, whereas the minimum temperatures were 448ºC, 447ºC, and 445ºC, respectively…..</td></tr>
<tr><td>8.</td><td>Tables 3 and 4. Put the unit in the table caption for better table presentation</td><td>Units in Tables 3 and 4 have been put in the table caption as suggested as follows:<br><br>Table 3. Chemical composition (wt.%) and HHV (MJ/kg) of the feedstocks
<table>
<tr><th>Compound</th><th>Formula</th><th>WCO</th><th>FCO</th></tr>
<tr><td>n-Hexadecanoic acid</td><td>$C_{16}H_{32}O_2$</td><td>37.43</td><td>36.81</td></tr>
<tr><td>Trans 13-Octadecanoic acid</td><td>$C_{18}H_{34}O_2$</td><td>42.02</td><td>44.26</td></tr>
<tr><td>Oleic acid</td><td>$C_{18}H_{34}O_2$</td><td>18.32</td><td>-</td></tr>
<tr><td>Squalene</td><td>$C_{30}H_{50}$</td><td>2.23</td><td>-</td></tr>
<tr><td>1-Hepatriacotanol</td><td>$C_{37}H_{76}O$</td><td>-</td><td>12.25</td></tr>
<tr><td>Z-(13,14-Epoxy/tetradec-11-en-1-ol acetate</td><td>$C_{16}H_{28}O_3$</td><td>-</td><td>6.67</td></tr>
<tr><td>HHV</td><td></td><td>39.3</td><td>39.1</td></tr>
</table>
Table 4. Chemical composition (wt.%), carbon component (wt.%), and HHV (MJ/kg) of the bio-oils
<table>
<tr><th></th><th colspan="4">WCO</th><th colspan="3">FCO</th></tr>
<tr><th></th><th>400ºC *)</th><th>450ºC</th><th>500ºC</th><th>550ºC</th><th>400ºC</th><th>450ºC</th><th>500ºC</th></tr>
<tr><td>Compound</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Aliphatics</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Alkanes</td><td>55.50</td><td>49.85</td><td>31.38</td><td>40.14</td><td>50.42</td><td>71.91</td><td>36.91</td></tr>
<tr><td>Cycloalkanes</td><td>4.78</td><td>5.32</td><td>-</td><td>5.56</td><td>4.13</td><td>3.00</td><td>4.31</td></tr>
<tr><td>Alkenes</td><td>39.72</td><td>44.83</td><td>58.25</td><td>45.05</td><td>45.45</td><td>24.07</td><td>53.34</td></tr>
<tr><td>Alkuna</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>5.44</td></tr>
<tr><td>Aromatic</td><td>-</td><td>-</td><td>10.37</td><td>9.26</td><td>-</td><td>1.02</td><td>-</td></tr>
<tr><td>Sum</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr>
<tr><td>Carbon component</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>$C_5$-$C_9$</td><td>8.26</td><td>8.93</td><td>12.91</td><td>22.09</td><td>7.32</td><td>11.26</td><td>7.83</td></tr>
<tr><td>$C_{10}$-$C_{15}$</td><td>43.78</td><td>54.39</td><td>46.19</td><td>34.42</td><td>52.41</td><td>44.97</td><td>44.74</td></tr>
<tr><td>$C_{16}$-$C_{20}$</td><td>47.96</td><td>36.68</td><td>39.48</td><td>43.50</td><td>35.71</td><td>40.95</td><td>39.54</td></tr>
<tr><td>$C_{21}$-$C_{25}$</td><td>-</td><td>-</td><td>1.42</td><td>-</td><td>2.35</td><td>-</td><td>5.83</td></tr>
<tr><td>$C_{26}$-$C_{30}$</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2.21</td><td>2.82</td><td>2.06</td></tr>
<tr><td>Sum</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr>
<tr><td>HHV</td><td>44</td><td>46</td><td>46</td><td>46</td><td>-</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td>9.</td><td>Section 3.5. Energy Consumption and Recovery: Please add discussion on $E_{BO}/E_{WCO}$ parameter given in Table 7.</td><td>Discussion on $E_{BO}/E_{WCO}$ parameter given in Table 7 has been discussed as shown in the third paragraph of Section 3.5 as follows:<br><br>…..The result also showed that the energy content of waste cooking oil can be recovered well as indicated by the high energy content of bio-oil which is proportional to the increase in the yield of bio-oil products.. In general, the bio-oil products contained about 64% to 90% of the energy content of waste cooking oil.”……..</td></tr>
</table>

| No | Comment | Revision |
|---|---|---|
| 10. | Please polish the language carefully. | The manuscript has been revised and improved.<br>Some grammar errors have been corrected and the writing style has been improved. |

**Date:** Dec 26, 2020
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**From:** "Journal of Analytical and Applied Pyrolysis" JAAP@elsevier.com
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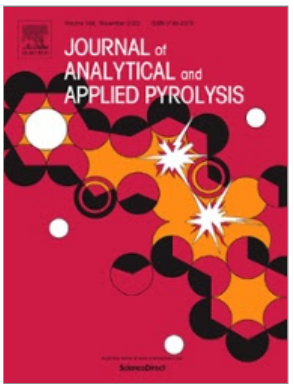


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