

PAPER • OPEN ACCESS

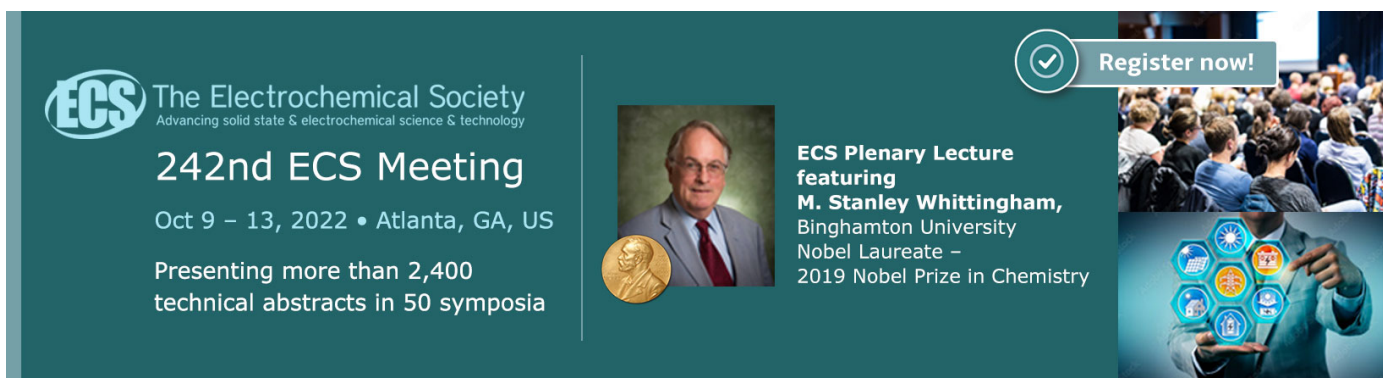
## Preface

To cite this article: 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **854** 011001

View the [article online](#) for updates and enhancements.

You may also like

- [Peer review declaration](#)
- [Preface](#)
- [Preface](#)





**ECS** The Electrochemical Society  
Advancing solid state & electrochemical science & technology


## 242nd ECS Meeting

Oct 9 – 13, 2022 • Atlanta, GA, US

Presenting more than 2,400 technical abstracts in 50 symposia

**ECS Plenary Lecture**  
featuring  
**M. Stanley Whittingham**,  
Binghamton University  
Nobel Laureate –  
2019 Nobel Prize in Chemistry

 **Register now!**



## THE 2ND INTERNATIONAL CONFERENCE ON SCIENCE AND INNOVATED ENGINEERING

9 - 10 November 2019, Melaka, Malaysia

### Banner



### Preface

The 2<sup>nd</sup> International Conference on Innovative Technology, Engineering, and Sciences is an inaugural conference organized by the Lhoksomawe State Polytechnique (PNL) and Optical Society of Malaysia (OSM). The main goal of i-COSINE is to bring together researchers, scientists and experts in universities, companies, institutions, communities, agencies, associations and societies to provide them a unique platform for sharing worldwide ideas as well as the recent developments on science and engineering technology. This conference has received nearly 90 participants from various field of technology, engineering, and sciences. It has attracted researchers and academicians from ASEAN region to gather in UNESCO World Heritage City of Melaka, Malaysia. A compilation of articles that represent the significant results of the conference has been selected to publish in this volume.

Two core research topics have been compiled and listed as follows:

1. Engineering and Technology
  - Chemical Engineering
  - Civil Engineering
  - Electrical Engineering
  - Environmental Engineering
  - Mechanical Engineering
  - Food Technology
  
2. Science
  - Chemistry
  - Physics
  - Mathematics
  - Green and Social Innovation



## Editors

Usman

Nelly Safitri

Sulaiman Wadi Harun

Anas Abdul Latiff

Mohd Fauzi Ab Rahman

Muhammad Taufiq Ahmad

Muhammad Farid Mohd Rusdi

## Event Pictures







### **List of Committee**

#### **Advisor**

Sulaiman Wadi Harun (University of Malaya, Malaysia)  
Waleed S. Mohammed, Thailand (Bangkok University, Thailand)  
Marwan (Syiah Kuala University, Indonesia)  
Kaharudin Dimiyati (University of Malaya, Malaysia)  
Zahriladha Zakaria (Universiti Teknikal Malaysia Melaka, Malaysia)

#### **Conference Chair**

Usman  
Hazli Rafis Abdul Rahim

#### **Secretary**

Ahmad Haziq Aiman Rosol  
Zuraidah Harith  
Alfian Putra  
Busra

#### **Committee Member**

Aminah Ahmad  
Arni Munira Markom  
Mohd Erfy Ismail  
Muhammad Fahmi Hisamudin  
Muhammad Taufiq Ahmad  
Muhammad Farid Mohd Rusdi

Ahmad Razif Muhammad  
Anas Abdul Latiff  
Mohd Fauzi Ab Rahman  
Afiq Arif Aminuddin Jafry  
Nabilah Kasim  
Haziezol Helmi Mohd Yusof  
Mohd Adzimnuddin Mohd Nor Azami  
Malathy Batumalay  
Mursyidah  
Suryati  
Azwar  
Nelly Safitri  
Musbar  
Elwina  
Hamdani  
Zulkarnaini

PAPER • OPEN ACCESS

## Delegates

To cite this article: 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **854** 011002

View the [article online](#) for updates and enhancements.

## You may also like

- [Preface](#)
- [International MEMS Conference 2006](#)  
Francis E H Tay, Miao Jianmin, John Bergstrom et al.
- [Guest Editor's introduction](#)  
B K Tanner



The banner features the ECS logo on the left, a central portrait of M. Stanley Whittingham with a Nobel Prize medal, and a 'Register now!' button with a checkmark icon on the right. The background includes a photo of a conference audience and a person interacting with a futuristic interface.

**ECS** The Electrochemical Society  
Advancing solid state & electrochemical science & technology

**242nd ECS Meeting**  
Oct 9 – 13, 2022 • Atlanta, GA, US  
Presenting more than 2,400  
technical abstracts in 50 symposia

**ECS Plenary Lecture**  
featuring  
**M. Stanley Whittingham**,  
Binghamton University  
Nobel Laureate –  
2019 Nobel Prize in Chemistry

Register now!

Name	Institution
Noraini Marsi	Universiti Tun Hussein Onn Malaysia
Z Erwanto	Politeknik Negeri Banyuwangi
E Kurniasih	Lhokseumawe State of Polytechnic
Husaini	Laboratory of Computational Mechanics, Department of Mechanical Engine
Suryati	Politeknik Negeri Lhokseumawe
Muryanto muryanto	Research Center for Chemistry – LIPI
Nazaruddin	Politeknik Negeri Lhokseumawe
Ratna Sari	Lhokseumawe State Polytechnic
Salahuddin	Politeknik Negeri Lhokseumawe
Lim JW	INTI International University
Syarwan	Politeknik Negeri Lhokseumawe
Mulizar	Politeknik Negeri Lhokseumawe
Tomi Erfando	Universitas Islam Riau
WN Wari	Politeknik Negeri Banyuwangi
S D Said	Chemical Engineering Dept. Syiah Kuala University, Indonesia
B Nizamani	University of Malaya, Malaysia
M K Afdhol	Universitas Islam Riau
N Ahmed	UiTM Terengganu Kampus Dungun
S Diana	Politeknik Negeri Lhokseumawe
Yanty Maryanty	Politeknik Negeri Malang
S Omar	UiTM Terengganu
Faisal Rizal	Politeknik Negeri Lhokseumawe
Omer A Alawi	University of Malaya
N Lusi	Politeknik Negeri Banyuwangi
Faisal Mahmud	University of Malaya
Meri Andriani	Samudra University
Syafruddin	Politeknik Negeri Lhokseumawe
Abdul Muhyi	Politeknik negeri lhokseumawe
Victoria Kristina Ananingsih	Soegijapranata Catholic University
Marlina Marzuki	Politeknik Negeri Lhokseumawe
Zulkarnaini	Lhokseumawe State Polytechnic
Muhammad Nasir	Politeknik Negeri Lhokseumawe
Yanni Sudiyani	Research Center for Chemistry, Indonesian Institute of Sciences
Salmyah	Lhokseumawe State Polytechnic
Milawarni	Politeknik Negeri Lhokseumawe
Dasmi Husin	Politeknik Negeri Lhokseumawe
Arni Munira Markom	Universiti Teknologi MARA, Cawangan Johor
Salahuddin	Politeknik Negeri Lhokseumawe
Abdolreza Toudehdeghhan	INTI International University
Mustika Amri	Politeknik Negeri Lhokseumawe
T Handhika	Gunadarma University
A F Pratiwi	State Polytechnic of Cilacap
Abdolreza Toudehdeghhan	INTI International University
R A M Yusoff	Universiti Teknologi Malaysia
A A A Jafry	Universiti Teknologi Malaysia
Yayat Ruhiat	Universitas Sultan Ageng Tirtayasa
N Tri Suswanto Saptadi	Universitas Atma Jaya Makassar
D Andrian	University of Indonesia
T Karima	Universitas Indonesia
Nur Farah Syuhada Mohan	Universiti Teknikal Malaysia Melaka





K N Yudyawati	Universitas Indonesia
Nurul Fadillah	Samudra University
N Novianda	Samudra University
T Rihayat	Politeknik Negeri Lhokseumawe
T Rihayat	Politeknik Negeri Lhokseumawe
T Rihayat	Politeknik Negeri Lhokseumawe
Suryani	Politeknik Negeri Lhokseumawe
N Safitri	Politeknik Negeri Lhokseumawe
Ahmad Ihsan	Samudra University
M S Rosid	Physics Department, Universitas Indonesia
R Widyarta	Universitas Indonesia
M A Naufal	Universitas Indonesia
M F Khoir	Universitas Indonesia
Murni	Gunadarma University
Noor Hindryawati	Mulawarman University
C Huda	Universitas Airlangga Surabaya, Universitas Kanjuruhan Malang
D P Lestari	Gunadarma University
Murni	Gunadarma University
A Singh	INTI International University
E S Nugroho	Universitas Indonesia
L Lindawati	Politechnic of South Aceh
Mohd Sufian bin Abdul Har	Universiti Teknologi Malaysia Kuala Lumpur
Zulfikar	Politeknik Negeri Lhokseumawe
Busra	Politeknik Negeri Lhokseumawe
Atthariq	Politeknik Negeri Lhokseumawe
M S Rosid	Universitas Indonesia
Yanty Maryanty	politeknik negeri malang
Amri	Politeknik Negeri Lhokseumawe
Fauziah Che Mat	Politeknik Port Dickson
M F A Rahman	Universiti Teknikal Malaysia Melaka
Nelly Safitri	Politeknik Negeri Lhokseumawe
E Elwina	Politeknik Negeri Lhokseumawe
N Rosli	Universiti Sains Malaysia
M A M Johari	University of Malaya
N Nahar	Politeknik Negeri Lhokseumawe

**Email address**

norainimarsi@gmail.com  
zulis.erwanto@poliwangi.ac.id  
ekakurniasih@pnl.ac.id  
husainiftm@unsyiah.ac.id  
suryati@pnl.ac.id  
moeryanto.mrt@gmail.com  
nazar\_aw@yahoo.com  
ratnasari@pnl.ac.id  
salahuddin.mt@pnl.ac.id  
jinwei.lim@newinti.edu.my  
kikiyolanda956@gmail.com  
fliah360@gmail.com  
tomierfando@eng.uir.ac.id  
naris@poliwangi.ac.id  
syahiddin@che.unsyiah.ac.id  
nizamanibilal@yahoo.com  
afdhol@eng.uir.ac.id  
norizan.ahmed@gmail.com  
selviediana@pnl.ac.id  
yanty.maryanty@polinema.ac.id  
suzianaomar@gmail.com  
ariputrap97@gmail.com  
omer.adnan85@gmail.com  
nurainilusi@poliwangi.ac.id  
nashrul@um.edu.my  
meri\_tind@unsam.ac.id  
irsyafruddin@yahoo.co.id  
miftahulhamzijaisal@gmail.com  
kristina@unika.ac.id  
marlina.marzuki78@gmail.com  
zulkarnaini@pnl.ac.id  
nasiraceh76@gmail.com  
sudiyani@gmail.com  
salmyah@pnl.ac.id  
milawarnimila@gmail.com  
dasmihusin@pnl.ac.id  
arnimunira@uitm.edu.my  
salahuddintik@pnl.ac.id  
abdolreza.toudehdehghan@newinti.edu.my  
mustika.amr@gmail.com  
handhika.tri@gmail.com  
art\_dhita@yahoo.com  
abdolreza.toudehdehghan@newinti.edu.my  
r.addayusoff92@gmail.com  
r.addayusoff92@gmail.com  
guntaray@untirta.ac.id  
ntsaptadi@yahoo.com  
davidandrian92@yahoo.co.id  
tanisakarima@gmail.com  
nursyuhada0907@gmail.com

syamsu.rosid@ui.ac.id  
nurulfadillah@unsam.ac.id  
novianda\_tif@unsam.ac.id  
teukurihayat@yahoo.com  
teukurihayat@yahoo.com  
teukurihayat@yahoo.com  
suryanisalim@yahoo.com  
nellysafitri@pnl.ac.id  
ahmadihsan@unsam.ac.id  
syamsu.rosid@ui.ac.id  
syamsu.rosid@ui.ac.id  
ahganiya@gmail.com  
Khoirfarkhan25@gmail.com  
murnipskm@staff.gunadarma.ac.id  
hindryawati@gmail.com  
choirul@unikama.ac.id  
dewi\_putrie@staff.gunadarma.ac.id  
achmad\_fahrurozi@staff.gunadarma.ac.id  
arwinders.jigiris@newinti.edu.my  
ezranugroho@Gmail.com  
lindawati203@gmail.com  
msufianahamid@gmail.com  
zul\_elka@pnl.ac.id  
muhammad.arhami@gmail.com  
atthariq.huzaifah@pnl.ac.id  
syamsu.rosid@ui.ac.id  
yanty.maryanty@polinema.ac.id  
amri@pnl.ac.id  
mbhisyam@um.edu.my  
mfauziar@utem.edu.my  
nellysafitri@pnl.ac.id  
elwina@pnl.ac.id  
nurizatiroli@student.usm.my  
swharun@um.edu.my  
nahar@gmail.com

PAPER • OPEN ACCESS

## Development of Castor Oil as Local Demulsifier to Overcome Water-Oil Emulsion

To cite this article: Tomi Erfando *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **854** 012013

View the [article online](#) for updates and enhancements.

You may also like

- [The role of oxygen in a carbon source \(castor oil versus paraffin oil\) in the synthesis of carbon nano-onions](#)  
Annah Makhongoana, Boitumelo J Matsoso, Thomas H Mongwe et al.
- [Evaluation of frequency-dependent ultrasound attenuation in transparent medium using focused shadowgraph technique](#)  
Yukina Iijima and Nobuki Kudo
- [The buoyancy method—a potential new primary ultrasound power standard](#)  
Srinath Rajagopal and Adam Shaw



The advertisement features a dark teal background. On the left, the ECS logo is displayed above the text 'The Electrochemical Society Advancing solid state & electrochemical science & technology'. Below this, the '242nd ECS Meeting' is announced for 'Oct 9 – 13, 2022 • Atlanta, GA, US', with a note that it is 'Presenting more than 2,400 technical abstracts in 50 symposia'. In the center, a portrait of M. Stanley Whittingham is shown next to a Nobel Prize medal. To the right of the portrait, text identifies the 'ECS Plenary Lecture featuring M. Stanley Whittingham, Binghamton University Nobel Laureate – 2019 Nobel Prize in Chemistry'. A 'Register now!' button with a checkmark icon is positioned above a photograph of a large audience seated in a lecture hall. In the bottom right corner, a person is shown interacting with a futuristic, glowing interface of various icons.

**ECS** The Electrochemical Society  
Advancing solid state & electrochemical science & technology

**242nd ECS Meeting**  
Oct 9 – 13, 2022 • Atlanta, GA, US  
Presenting more than 2,400  
technical abstracts in 50 symposia

**ECS Plenary Lecture**  
featuring  
**M. Stanley Whittingham**,  
Binghamton University  
Nobel Laureate –  
2019 Nobel Prize in Chemistry

Register now!

# Development of Castor Oil as Local Demulsifier to Overcome Water-Oil Emulsion

Tomi Erfando<sup>1\*</sup>, Devin Theo Handoko<sup>1</sup>, Idham Khalid<sup>1</sup>

<sup>1</sup> Department of Petroleum Engineering, Universitas Islam Riau Kaharuddin Nasution No.113, Pekanbaru, Riau, Indonesia

Email: tomierfando@eng.uir.ac.id

**Abstract.** Crude oil is generally mixed with water at the time of production. The oil and water mixture at the time of production is known as an emulsion. In addressing the problem of emulsions requires the addition of a chemical compound, commonly referred to as demulsifier to be able to separate water and oil. This research aims to make the formulation of demulsifier locally based on castor oil. This castor oil will be processed into a surfactant compound because it has a very high saturated fat content of 33% of the total weight of the seeds. The manufacture of this demulsifier using saponification method is to heat the castor oil and add the KOH dissolved in aquades, as well as the added glycerin to taste. Then, the process of testing demulsification with a sample of the emulsion of crude oil that has been prepared using the bottle test method. From the test results of several temperature conditions, different concentration and time obtained the best test results by demulsifier in the separation of water and oil at a temperature of 80 °C and concentrations of 5 ml. In sample 1 demulsifier soap and the soap demulsifier added lemon separates the water by as much as 38 ml and 39 ml, meanwhile, the commercial demulsifier separates the water by 32 ml. Thus, it can be concluded that the demulsifier made from castor oil has a better ability than commercial demulsifier.

## 1. Introduction

In the stage of production and oil processing is often the problem is the water emulsion in the oil is stable. The formation of this emulsion is generally caused by the presence of resins and asphaltenes which act as "natural emulsifiers", as well as wax and solids (Al-Sabagh, Kandile, El-Ghazawy, & Noor El-Din, 2011). In addressing the problem of emulsions requires a requirement to convert the emulsion into a normal return. This requirement is a material that can stabilize the system between surfaces. This ingredient is usually called a stabilizer, or also known as demulsifier (Gavrielatos, Dabirian, Mohan, & Shoham, 2018). Overcoming this emulsion problem is also done to keep the production facility from damage and improve the oil quality itself (Sulaiman et al., 2015).

According to the research of Sulaiman et al., (2015) showed that the demulsifer produced from the local ingredients is very effective in terms of the cheaper price, effective time and solving the crude oil emulsion in a shorter time than on conventional demulsifier. Researchers conducted a test of demulsification using the bottle test method with several parameters, such as temperature, concentration and time. According to Zhou, Dismuke, Lett, & Penny, (2012) to meet the safety standards in the oil



and gas world and reduce the impact that occurred on the environment resulting from the use of demulsifier with chemicals, then it takes a new formulation as a demulsifier with develop from local ingredients. Therefore, in this research try to develop a formulation of demulsifier by using local ingredients namely castor oil.

This castor oil will be processed into a surfactant compound because it has a very high saturated fat content of 55% for the core part of the seed or 33% of the total weight of the seed (Sari, Kasih, & Sari, 2010). In the process of making surfactant compounds using the saponification method. Saponification is the process of alkaline hydrolysis to fat from oil by adding KOH (Naomi, Gaol, & Toha, 2013). Furthermore, the local demulsifier that has been made will be conducted by the process of crude oil samples with a demulsification process using the bottle test method. Using this method demulsifier can quickly separate water and oil with the lowest possible moisture content (Manggala, Kasmungin, & Fajarwati, 2017). Then to know the influence of demulsifier with some observed parameters such as temperature, concentration and time in the research, then the analysis is done Regeresi equations using "Minitab Software" (Sungkawa, 2013).

## 2. Materials And Methods

The method used in this research is the experimental method. In the mention of demulsifier using the saponification method and for testing the effectiveness of demulsifer that has been made using the bottle test method. The materials used in this study are castor oil, local lemon, KOH, glycerin, equadest, commercial finalizing, and X field oil samples.

## 3. Research Procedures

### 3.1. Production of Demulsifier

Manufacture of finalizing according to Paramita et al., (2014) using castor oil with saponification method as follows ; heat the oil range 25,79 gr with a temperature of 70 °C for 30 minutes. Then dissolve KOH 8,15 gr with the aquadest as much as 16,3 gr. Gently insert the KOH and Aquades solution into the previously heated range oil. Stir the solution using magnetic stirrer at 800 rpm for  $\pm$  100 minutes. Add the glycerin 10 ml into the castor oil solution. Then add 60 ml of the aquadest into the solution.

### 3.2. Demulsification With Bottle Test Method

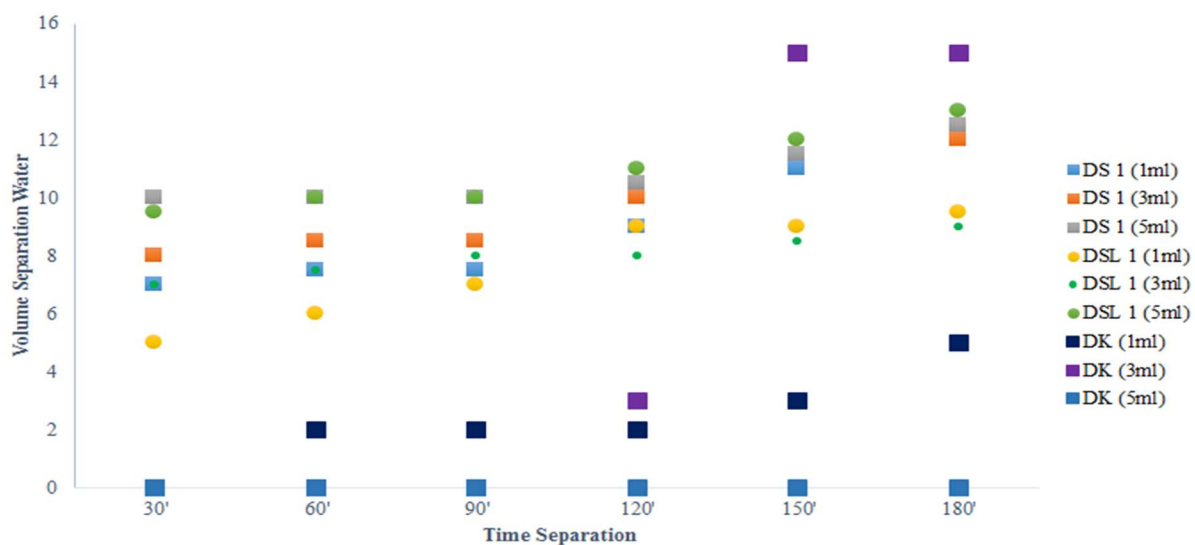
Bottle test procedure according to Erfando et al., (2019) and Impian & Praputri, (2014) including the following ; Prepare a demulsifer formulation that will be injected into the crude oil emulsion. Insert the crude oil emulsion samples into the test bottle as much as 50 ml. Inject the demulsifier formula into the test bottles that have been filled with the crude oil emulsion with each concentration of 1 ml, 3 ml, 5 ml. Place the test bottle into the Waterbath using the temperature to be tested that is 40 °C, 60 °C, 80°C. Bottle test time is for 3 hours and observed every 30 minutes.

## 4. Results And Discussion

This research aims to determine the ability to demulsifier locally sourced castor oil which is reviewed from several variables, such as temperature, concentration, and timing. This research also aims to determine the effectiveness of the ratio of the demulsifier formula to local oil with a commercial demulsifier to the separation process of the water-in-oil emulsion (W/O). Temperature is an important factor that affects the emulsion stability. The higher the temperature, the more unstable and vice versa, the lower the temperature and the more stable the emulsion (Manggala et al., 2017). This study made a formula for demulsifier as many as 3 formulae, which is a surfactant demulsifier (DS) made of local material namely castor oil, demulsifier a lemon surfactant (DSL) that is a mixture of formulation of Surfactant demulsifier From the available lemon and commercial demulsifier.

#### 4.1. Temperature Conditions 40 °C

The results of this study at a temperature of 40 °C in Sample 1 can be seen in **Figure 1**. demulsifier surfactant (DS) is high in breaking down the emulsion at 5 ml concentrations of 12,5 ml. In the commercial demulsifier (DK) only able to break down the emulsion at a concentration of 1 ml by 5 ml. This is because the commercial demulsifier is more effective in high temperature, where the combination of heat and the application of chemicals designed can decide the interfacial film (Sulaiman et al., 2015). Meanwhile, lemon surfactant demulsifier can solve the emulsion by 13 ml with 5 ml concentration. According to Kokal, Al-juraid, & Aramco, (1999) several factors affect the performance of demulsifier namely because of the stability properties of the emulsion, the factors influencing it is low temperature and heavy oil type. According to Wylde, Coscio, & Barbu (2008) in this temperature is seen as the result of high water separation influenced by temperature. Known the lower the temperature then the emulsion will stabilize.



**Figure 1.** Water separation result of testing time at 40 °C

#### 4.2. Temperature Conditions 60 °C

At 60 °C temperature, the result of water separation from the emulsion has increased compared with the previous temperature, where it is seen that all types of demulsifier have been able to break down the emulsion in all concentrations. From the result in **Figure 2**. It is seen that the surfactant demulsifier (DS) is also able to work as a commercial demulsifier (DK). The result of emulsion breakdown using commercial demulsifier (DK) is 28 ml with 5 ml concentration. Solving the highest emulsions use surfactant demulsifier (DS) of 31,5 ml with a concentration of 5 ml (Sulaiman et al., 2015). Whereas a lemon surfactant demulsifier (DSL) can solve a very high emulsion of 32.5 ml with a concentration of 5 ml since the lemon it self contains citric acid which amounts to 90% of the total organic acids (Sadka, Dahan, Cohen, & Marsh, 2000). Inorganic acids, especially citric acid, has excellent demulsification efficiency in crude oil emulsions because citric acid has more carboxyl groups that can participate in the reaction, resulting in more demulsification efficiency High than other acids (Liu et al., 2018).

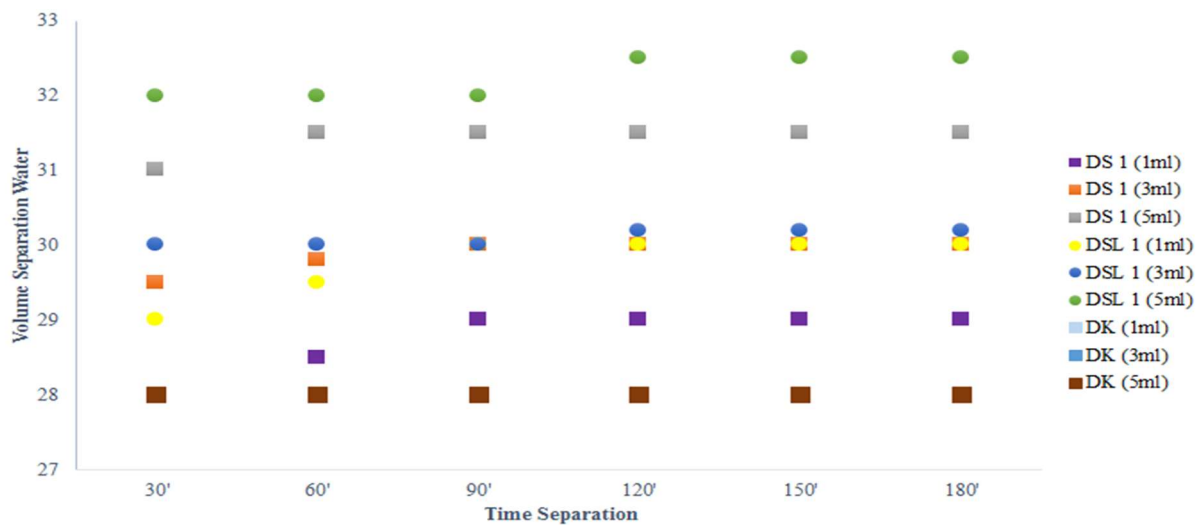


Figure 2. Water separation result to test time in temperature 60 °C

4.3. Temperature Conditions 80 °C

At 80 °C The result of water separation from emulsions in all types of demulsifier both locally and commercially experienced a drastic increase from the previous can be seen in Figure 3. It appears that the result of water separation from the emulsion in a commercial demulsifier sample (DK) at a concentration of 5 ml is 39 ml. Where good characteristics of demulsifier one of them are the faster separation (Rita & Hadi, 2017). In other results use surfactant demulsifier (DS) with a concentration of 5 ml can separate water by 38 ml. While a lemon surfactant demulsifier (DSL) with a concentration of 5 ml can separate water by 39 ml. The higher the test temperature then The separation that looks faster and a lot of water is separated. This indicates the high temperature and high concentration of the demulsifier injection greatly affects the demulsification process. The high concentration of demulsifier greatly affects the voltage between fluid loading (Kang, Jing, Zhang, Li, & Wu, 2006).

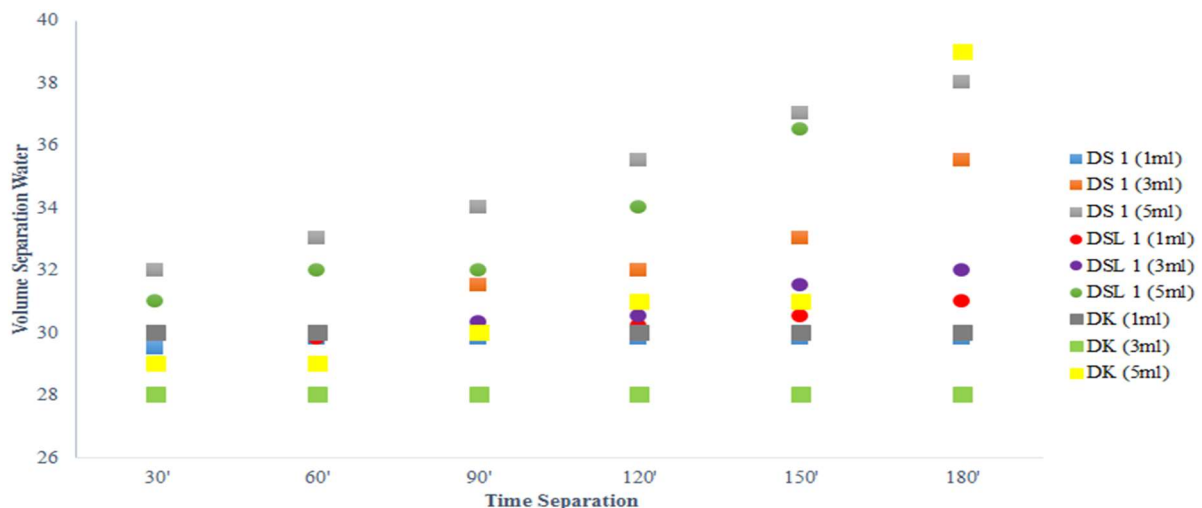


Figure 3. Water separation result to test time in temperature 80°C

4.4. Statistical Analysis Of Regression And Correlation Using Minitab Software

In this study also saw how much influence of temperature and concentration on water separation from oil emulsion with statistical calculations using MINITAB application. Minitab provides various programs for the complete processing of statistical data, such as regression analysis, statistical quality

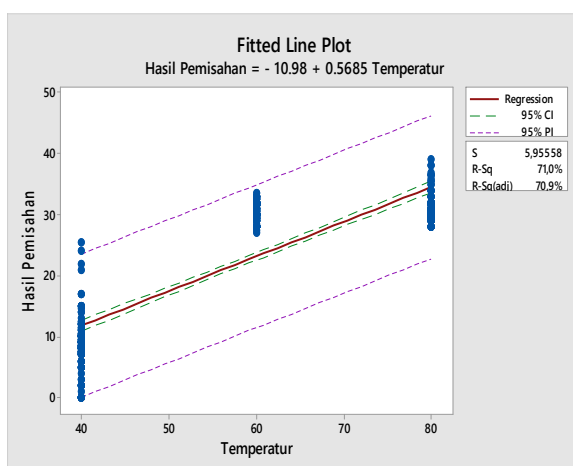


control, forecasting with time series analysis and other (Wahyuni, Agoestanto, & Pujiastuti, 2018). Here's the result of statistical calculations with Minitab application.

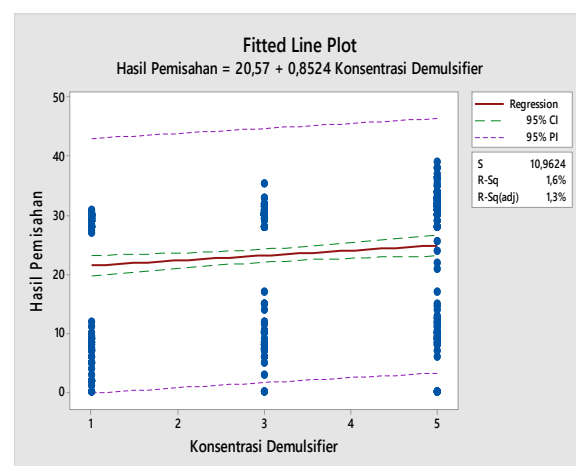
**Table 1.** Results of regression and correlation of Software Minitab

Parameters	P-Value	R-Sq	R-Sq (adj)
Temperature	0	71.0	70.9
Concentration	0.014	1.6	1.3

A comparison of linear regression models determines the influence of X variables on Y (P. Subekti, 2015). If a positive result is obtained, the value of X variables will be equal to the value of the variable Y. From **Table 1**. In regression analysis, the value of P or P-value was obtained at 0.000 which means that the value of P is smaller than the significant criteria of 0.05 so that the free variable has a significant effect on the associated variables. At the output P-value obtained from the temperature is only less than the value of significance ( $\alpha = 0.05$ ) means that the linear regression model meets the criteria of linearity and the changes occurring are very significant (Draper & Smith, 1998). Besides, the value of R-esq (adj) of 70,9% can be seen in **Figure 4**. This means the effect of temperature on water separation in the demulsification process of 70,9% and the remaining 29,1% is the influence of other free variables in addition to temperature (Wahyuni et al., 2018). In this case, it means the correlation of temperature to the separation of the demulsification result is very high because its value is almost close to 1 or 100% and with its positive value indicates that both variables or tested parameters are increased together (Pratomo & Astuti, 2014)



**Figure 4.** Fitted Line Plot temperature vs water separation



**Figure 5.** Fitted Line Plot concentration vs water separation

In **Figure 5**. The value of the coefficient of determination or R-esq (adj). The value of this coefficient of determination is used to know how large the associated variables are influenced by free variables. From the results of the regression analysis obtained the value of R-esq (adj) by 1,3%, this indicates that the variable on the separation of water is influenced by the free variable (concentration) of 1,3% and the residual amount is 98,7% influenced by variables other than concentration (Wahyuni et al., 2018). In

this regard, the higher the centralization of the water separation result from the demulsification process is increasingly higher (Puji Subekti, 2015). Also, the correlation value gained a positive value of 1,3. The result of this value means that the correlation of the concentration on the water separation of demulsification result is low because its value is far from 1 and with positive value indicates that both variables or parameters are tested with (Pratomo & Astuti, 2014). The difference in the efficiency rate of the demulsification of each of the formulas can be due to unequal homogenization of each sample and the durability and quality differences of each formula acting at a certain temperature (Erfando.T, Irma Elfradina, 2019).

## 5. Conclusion

The retractable conclusion in this study is that local demulsifier samples were able to break down the emulsion throughout the test temperature, the highest separation occurred at 80 °C with an optimal concentration of 5 ml, namely the surfactant demulsifier (DS) amounted to 38 ml and a lemon surfactant demulsifier (DSL) of 39 ml, while the commercial demulsifier (DK) at a concentration of 5 ml at 40 °C was not able to break down the emulsion. The effect of temperature and concentration on water separation in the order of 70,9% and 1,3%. In this case that has the greatest influence among some parameters of the regression analysis data is the temperature of 70,9%.

## Acknowledgements

Thank you for University Relationship Program (URP) PT. Chevron Pasific Indonesia for the support of financial for the publication of this research.

## References

- [1] Al-Sabagh, A. M., Kandile, N. G., El-Ghazawy, R. A., & Noor El-Din, M. R. (2011). Synthesis And Evaluation Of Some New Demulsifiers Based On Bisphenols For Treating Water-In-Crude Oil Emulsions. *Egyptian Journal Of Petroleum*, 20(2), 67–77. <https://doi.org/10.1016/J.Ejpe.2011.06.008>
- [2] Draper, N. R., & Smith, H. (1998). *Applied Regression Analysis* (Vol. 326). John Wiley & Sons.
- [3] Erfando.T, Irma Elfradina, N. R. (2019). Effects Of Adding Local Materials On Demulsifier Performance For Oil-Water Emulsions. *International Journal Of Geomate*, 17(62), 107–112. <https://doi.org/10.21660/2019.62.Icee9>
- [4] Erfando, T., Cahyani, S. R., & Rita, N. (2019). The Utilization Of Citrus Hystrix And Citrus Limon As An Organic Demulsifier Formulation. In *Iop Conference Series: Materials Science And Engineering* (Vol. 509, P. 12145). Iop Publishing.
- [5] Gavrielatos, I., Dabirian, R., Mohan, R., & Shoham, O. (2018). Spe-190114-Ms Nanoparticle And Surfactant Oil / Water Emulsions - Is Different Treatment Required? *Spe Western Regional Meeting*.
- [6] Impian, D., & Praputri, E. (2014). Optimasi Injeksi Demulsifier Sebagai Respon Terhadap Proses Acidizing, 4(4).
- [7] Kang, W., Jing, G., Zhang, H., Li, M., & Wu, Z. (2006). Influence Of Demulsifier On Interfacial Film Between Oil And Water, 272, 27–31. <https://doi.org/10.1016/J.Colsurfa.2005.07.004>
- [8] Kokal, S., & Al-Juraid, J. (1999). Quantification Of Various Factors Affecting Emulsion Stability: Watercut, Temperature, Shear, Asphaltene Content, Demulsifier Dosage And Mixing Different Crudes. *Spe Annual Technical Conference And Exhibition*, 56641. <https://doi.org/10.2118/56641-ms>
- [9] Liu, D., Suo, Y., Zhao, J., Zhu, P., Tan, J., Wang, B., & Lu, H. (2018). Effect Of Demulsification For Crude Oil-In-Water Emulsion: Comparing Co<sub>2</sub>and Organic Acids. *Energy And Fuels*, 32(1), 757–764. <https://doi.org/10.1021/Acs.Energyfuels.7b03334>
- [10] Manggala, M. R., Kasmungin, S., & Fajarwati, K. (2017). Studi Pengembangan Demulsifier Pada Skala Laboratorium Untuk Mengatasi Masalah Emulsi Minyak Di Lapangan“ Z”, Sumatera Selatan. In *Prosiding Seminar Nasional Cendekiawan* (Pp. 145–151).

- [11] Naomi, P., Gaol, A. M. L., & Toha, M. Y. (2013). Bekas Ditinjau Dari Kinetika Reaksi Kimia, *19*(2), 42–48.
- [12] Paramita, N., Fahrurroji, A., & Wijianto, B. (2014). Optimasi Sabun Cair Ekstrak Etanol Rimpang Zingiber Officinale Rosc. Var. Rubrum Dengan Variasi Minyak Jarak Dan Kalium Hidroksida. *Journal Of Tropical Pharmacy And Chemistry*, *2*(5), 272–282.
- [13] Pratomo, D. S., & Astuti, E. Z. (2014). Analisis Regresi Dan Korelasi Antara Pengunjung Dan Pembeli Terhadap Nominal Pembelian Di Indomaret Kedungmundu Semarang Dengan Metode Kuadrat Terkecil. *Ilmu Komputer*, (1).
- [14] Rita, N., & Hadi, G. (2017). Evaluasi Efisiensi Proses Crude Oil Dehydrtation Di Cgs 5 Lapangan X Provinsi Riau. *Jurnal Mineral, Energi Dan Lingkungan*, *1*(1), 16–27.
- [15] Sadka, A., Dahan, E., Cohen, L., & Marsh, K. B. (2000). Aconitase Activity And Expression During The Development Of Lemon Fruit. *Physiologia Plantarum*, *108*, 255–262. <https://doi.org/10.1034/J.1399-3054.2000.108003255.X>
- [16] Sari, T. I., Kasih, J. P., & Sari, T. J. N. (2010). Pembuatan Sabun Padat Dan Sabun Cair Dari Minyak Jarak. *Jurnal Teknik Kimia*, *17*(1).
- [17] Subekti, P. (2015). Perbandingan Perhitungan Matematis Dan Spss Analisis Regresi. *Seminar Nasional*, *3*(June).
- [18] Subekti, P. (2015). Perbandingan Perhitungan Matematis Dan Spss Analisis Regresi Linear Studi Kasus (Pengaruh Iq Mahasiswa Terhadap Ipk). *Prosiding Snatika 2015*, *3*, 70–75.
- [19] Sulaiman, A. D. I., Abdulsalam, S., Technology, E., Tafawa, A., Francis, A. O., & Polytechnic, A. (2015). Formulation Of Demulsifiers From Locally Sourced Raw Materials For. *Spe*, *178377–Ms*.
- [20] Sungkawa, I. (2013). Penerapan Analisis Regresi Dan Korelasi Dalam Menentukan Arah Hubungan Antara Dua Faktor Kualitatif Pada Tabel Kontingensi. *Jurnal Mat Stat*, *13*(1), 33–41.
- [21] Wahyuni, T., Agoestanto, A., & Pujiastuti, E. (2018). Analisis Regresi Logistik Terhadap Keputusan Penerimaan Beasiswa PPA di FMIPA Unnes Menggunakan Software Minitab. In *Prisma, Prosiding Seminar Nasional Matematika* (Vol. 1, Pp. 755–764).
- [22] Wylde, J. J., Coscio, S., & Barbu, V. (2008). A Case History Of Heavy Oil Separation In Northern Alberta: A Singular Challenge Of Demulsifier Optimization And Application. *Spe International*, 1–8. <https://doi.org/10.2118/117177-Pa>
- [23] Zhou, H., Dismuke, K. I., Lett, N. L., & Penny, G. S. (2012). Development Of More Environmentally Friendly Demulsifiers. In *Spe International Symposium And Exhibition On Formation Damage Control*. Society Of Petroleum Engineers.



2nd INTERNATIONAL CONFERENCE ON SCIENCE AND INNOVATED ENGINEERING

# CERTIFICATE

## OF PARTICIPATION

THIS CERTIFICATE IS PROUDLY PRESENTED  
FOR HONORABLE ACHIEVEMENT TO:

*Tommi Erfando*

CC050

"Development of Castor Oil as Demulsifier to Overcome Water-Oil Emulsion"

for presenting a paper at the 2nd International Conference on Science and Innovated Engineering  
2019 (I-COSINE 2019) held in Imperial Heritage Hotel, Melaka, Malaysia  
on 9 & 10 November 2019

9 NOV 2019

DATE

  
I-COSINE

I-COSINE 2019 CHAIR



**OSM**  
Optical Society of Malaysia