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Development of antifouling membrane film for treatment of oil-rich industrial waste

Vania Septa Anggraeni [a], Putu Doddy Sutrisna [b], Pei Sean Goh [c], Eric Wei Chiang Chan [a], Chen Wai Wong [d,*]

[a] Department of Food Science with Nutrition, Faculty of Applied Sciences, UCSI University, No. 1, Jalan Menara Gading, UCSI Heights, 56000 Cheras, Kuala Lumpur, Malaysia
[b] School of Chemical Engineering, University of Surabaya (UBAYA), Jalan Raya Kalirungkut, 60293, Surabaya, Indonesia
[c] Advanced Membrane Technology Research Centre (AMTEC), School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[d] Department of Biotechnology, Faculty of Applied Sciences, UCSI University, No. 1, Jalan Menara Gading, UCSI Heights, 56000 Cheras, Kuala Lumpur, Malaysia

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ABSTRACT

As the largest producers of palm oil, Malaysia disposes substantial amount of oil-rich industrial waste regularly. Untreated oil-rich wastewater reduces water quality and deteriorates aquatic ecosystems. Conventional method used in treating oil-rich waste involved precipitation, flocculation, coagulation, and biological treatment, which is disadvantageous due to the high cost, high chemical use, high land area required, and difficulty in maintaining the optimum condition for microorganisms' growth. Membrane technology showed potential in treating oil-rich waste due to the low cost, efficiency, and environmentally friendly properties. However, long term usage of membrane may result in oil fouling which will lower membrane performance. The present study attempted to use methyl gallate extracted from *Anacardium occidentale* leaves to mitigate oil fouling and maintain membrane performance over time. As polar compound, methyl gallate increased the hydrophilicity of cellulose acetate membrane. The developed methyl gallate/cellulose acetate membrane exhibited PWF of 56.28 ± 2.10 L $m^{-2}h^{-1}$ and rejection rates of 99.14 ± 0.03 % against oil emulsion. The membrane was able to achieve FRR of 98.73 ± 0.83 % after 4 cycles of filtration, indicating that anti-fouling properties have been enhanced.
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1. Introduction

As one of the largest exporters and producers of palm oil, Malaysia contributes to 11 % of the world's oils & fats production and 27 % of the export trade of oils & fats [1]. High production of palm oil proportionally increases the generation of oil-rich industrial waste. The high consumption of oil for household and industrial usage further escalates the disposal of untreated oil waste in water stream. Oil-rich waste must be treated properly before disposal. Oil-rich wastewater has an adverse effect on the environment. Direct disposal of oil-rich waste can disrupt aquatic ecosystem, and pollute water body [2,3]. It can cause rapid deoxygenation of water which can kill fish and inhibit growth of aquatic plant [4,5].

Oil-rich wastewater arise from different sectors such as automobile workshop, kitchens and restaurants, gas stations, petrochemical industry, and edible oil production unit [6]. Oil waste consists of free oil (>150 μm), dispersed oil (20–150 μm), and emulsified oil (<20 μm) [3]. Free or suspended oil can be easily separated, while emulsions that contains emulsifier or antifoaming agents require more complex processes, not biodegradable, and difficult to be treated [4,7]. Moreover, oil and grease may affect human health as it contains toxic and hazardous substances [4,8]. Regulation has set up a maximum discharge standard of 30 mg/L of oil/water emulsion that can be found in the ocean [9].

Several methods have been used to treat oil-rich wastewater such as flotation, coagulation, centrifugation, and biological treatment but these methods are unfavorable due to the high cost,

Abbreviations: Cellulose acetate, (CA); non-solvent induced phase separation, (NIPS); water contact angle, (WCA); pure water flux, (PWF); sodium dodecyl sulfate, (SDS); fouling recovery ratio, (FRR).

* Corresponding author.
E-mail address: wongcw@ucsiuniversity.edu.my (C.W. Wong).

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energy consuming, and not effective to remove oil droplets [3,5]. Membrane technology has shown potential in treating oil-rich wastewater as it can isolate solid particles and eliminate biodegradable substances [5]. Membrane technology has served its purposes in different areas such as for keeping food fresh [10–12], energy harvesting [13–15], sensors [16–18], biomedical applications [19–21], self-cleaning surfaces [16,17,22], tissue engineering [23,24], air filtration [25,26], and so on. It is also environmentally friendly, highly efficient, and has a low energy requirement [27]. Membrane technology can successfully separate oil droplets with particle size smaller than 10 μm [28].

Surface morphology is prerequisite for oil–water filtration. Secondary surface morphology can enhance or alter the properties and applications of membrane [29]. Surface morphology affect membrane wettability and membrane ability to desorb oil [29,30]. Among different structure, macroporous and branched structure generates outstanding oil absorption capacity [31–33]. Various polymers have been used to develop membranes for oil/water separation such as polystyrene (Ps), polyvinylidene fluoride (PVDF), polyurethane (PU), polyvinyl chloride (PVC), and so on [34]. Among them, cellulose acetate is commonly used due to its hydrophilic nature [35].

Surface modification has served as an effective method in improving antifouling property of the membrane. Surface modification increases hydrophilicity and increases foulant desorption on the membrane surface [36]. This study attempted to use of methyl gallate extracted from *Anacardium occidentale* leaves to improve the surface properties of membranes. In Malaysia, *A. occidentale* is medicinal herb that is commonly consumed raw (known as *ulam*) or sometimes blanched to reduce their stringent taste and are considered as appetizers in the traditional diet [37]. Methyl gallate is a polar compound that can be employed to increase the hydrophilicity of the membrane. The enhanced surface hydrophilicity causes oil desorption on membrane surfaces and reduces membrane fouling [8,35]. Although Esmaeili *et. al.* has used vanillin as natural product to improve hydrophilicity [38], the application of the membrane in oil–water separation has not been studied. To the best of our knowledge, this is the first study that attempted to use natural product to develop antifouling membrane for oil–water separation. The membranes were prepared using phase inversion method by mixing 17.5 % (w/w) cellulose acetate membrane with 0 to 7.5 % (w/w) of methyl gallate. Fig. 1 depicts the schematic illustrating diagram of the membrane fabrication process. The wettability of the developed membranes was evaluated using water contact angle goniometer. The performance of the membrane against oil fouling was determined.

2. Materials and method

Fresh *Anacardium occidentale* leaves were procured from the local market of Cheras, Kuala Lumpur, Malaysia. Cellulose acetate (CA), formamide, acetone, and Sephadex LH-20 were supplied by Sigma Aldrich. Methanol was provided by Fulltime. MCI gel CHP20P was obtained from Supelco. Silica Gel 60 was supplied by Merck.

2.1. Extraction and isolation of methyl gallate

Extraction and isolation of methyl gallate was done according to the methods described in our previous work [39]. Leaf of *Anacardium occidentale* was extracted using methanol by maceration method. Methanol was removed from the extract using rotary evaporator. Extraction was repeated for 3 times. Extract was further dried using oven and kept in fridge until further analysis. Isolation was done using three steps of chromatography with MCI gel CHP20P, Sephadex LH-20, followed by silica gel 60.

2.2. Membrane fabrication

Membrane fabrication used non-solvent induced phase separation (NIPS) or phase inversion technique according to the method by Sutrisna *et. al.* (2020) with some modifications [40]. 17.5 % (w/w) of cellulose acetate, 34 % (w/w) of formamide, 48.5 % (w/w) acetone was mixed to create a dope solution. The membrane was modified by adding 0 %, 2.5 %, 5 %, and 7.5 % (w/w) of methyl gallate during the dope solution preparation step. The solution was stirred for 24 h and allowed to degas. The solution was then cast on the surface of flat glasses and immersed in coagulation bath consisting of water for phase inversion to take place. The membrane was stored in water before further analysis. Table 1 summarizes the formulation of cellulose acetate membrane.

2.3. Wettability of membrane

The wettability property of the membrane was measured using water contact angle goniometer (Dataphysics, Germany). Static water contact angle (WCA) was measured using sessile drop method. Water droplet was deposited onto membrane surface with 1.0 μL of dosing volume and 0.5 μL of dosing rate. The water contact angle was recorded and the average of 10 measurements was taken.

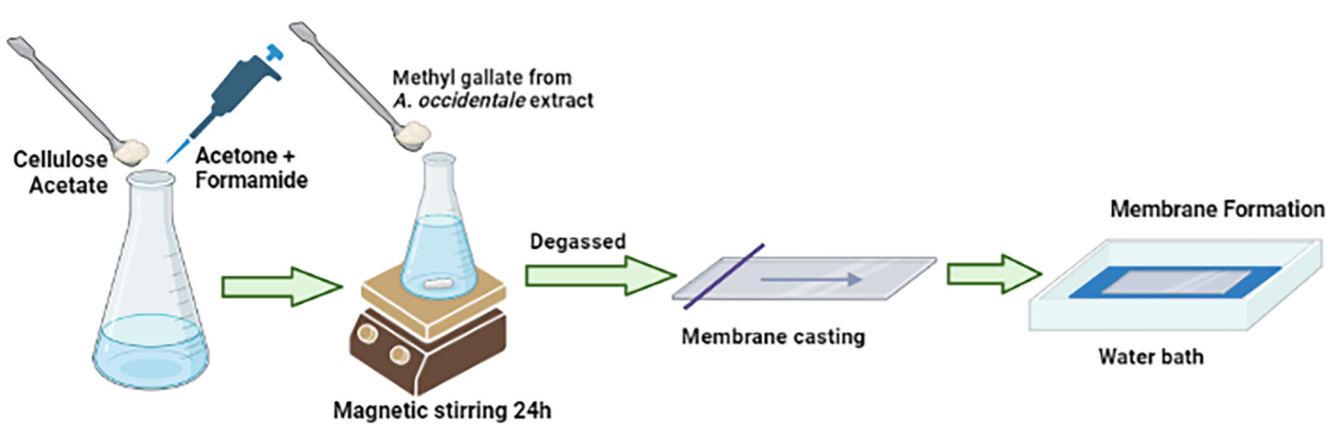

Fig. 1. Schematic illustrating diagram of CA/methyl gallate membrane fabrication process.

Table 1
Formulation of cellulose acetate membrane.

Membrane	Concentration (%)			
	Cellulose Acetate	Formamide	Acetone	Methyl Gallate
CA-0	17.5	34	48.5	0
CA-1	17.5	34	48.5	2.5
CA-2	17.5	34	48.5	5
CA-3	17.5	34	48.5	7.5

2.4. Performance evaluation and antifouling study of membrane

Cross flow permeation system was used to determine pure water flux (PWF), oil removal, and antifouling study of membrane. All membranes were initially compacted at 3 bar for 30 min with deionized water until a steady state is reached, the system pressure was then lowered down to 2 bar for flux determination. The permeate flux was calculated using the following equation [41]:

$$Jw = \frac{V}{A\Delta t} \tag{1}$$

where V is the volume of permeate (L), A is effective membrane surface area (m^2), and Δt is permeation time (h). Next, the feed solution was changed into 1000 ppm of oil/water emulsion. The emulsion was prepared according to the method used by Ismail *et. al.* (2019) by mixing cooking oil with sodium dodecyl sulfate (SDS) at 9:1 (w/w) ratio to obtain a stable oil/water emulsion [42].

The rejection R (%) was calculated according to the equation below [11]:

$$R(\%) = \left(1 - \frac{C_p}{C_f}\right)x100 \tag{2}$$

C_p and C_f represent oil concentration in permeation and feed side, respectively. Oil concentration was determined using UV–vis spectrophotometer (DR5000, Hach) at wavelength of 300 nm. Antifouling study was done in 4 cycles, in which one cycle consists of the following steps: pure water flux (J_{w1}) was measured for 30 min (Eq. (1)) and changed with 1000 ppm of oil/water emulsion. The permeate flux (J_p) was measured for 30 min according to Eq. (1) and the fouled membrane was washed for 30 mins with deionized water. Finally, water flux (J_{w2}) was measured again for 30 min and fouling parameters were calculated using equations as follows [13]:

$$\boldsymbol{FRR}(\%) = \frac{\boldsymbol{J_{w2}}}{\boldsymbol{J_{w1}}}\boldsymbol{x}100 \tag{3}$$

$$\boldsymbol{Rt} = \left(1 - \frac{\boldsymbol{J_p}}{\boldsymbol{J_{w1}}}\right)\boldsymbol{x}100 \tag{4}$$

$$\boldsymbol{Rr} = \left(\frac{\boldsymbol{J_{w2}} - \boldsymbol{J_p}}{\boldsymbol{J_{w1}}}\right)\boldsymbol{x}100 \tag{5}$$

$$\boldsymbol{Rir} = \left(\frac{\boldsymbol{J_{w1}} - \boldsymbol{J_{w2}}}{\boldsymbol{J_{w1}}}\right)\boldsymbol{x}100 \tag{6}$$

where FRR represent fouling recovery ratio, R_t represent total fouling, R_r represent reversible fouling and R_{ir} represent irreversible fouling.

2.5. Statistical analysis

The data were reported as mean ± SD of triplicate determinations. Significance differences of the results were analysed by one-way analysis of variance (ANOVA) followed by Tukey's HSD test. All statistical tests were performed using IBM SPSS Statistics 20 at a significance level of ($p < 0.05$).

3. Results and discussion

3.1. Wettability of membrane

The wettability of membrane indicates the degree of hydrophilicity of membrane. Surface must have sufficient hydrophilicity to transform the solid-oil interface into the solid-water–oil interface and to enable oil droplets to desorb from the surface [43]. In this study, WCA of cellulose acetate was determined. According to Fig. 2, all cellulose acetate membranes have hydrophilic interaction with water as the WCA is<90° [44]. Lower WCA indicates higher hydrophilicity. Hydrophilic membrane is favorable against oil fouling as membrane can create water layer and desorb oil which will minimize permeation flux decline [34]. The neat membrane has the highest WCA at 68.01°±2.04. Hydrophilicity generally increases with increasing concentration of methyl gallate. However, CA-3 with 7.5 % of methyl gallate have higher WCA as compared to CA-2 membrane. The reduction of membrane hydrophilicity showed that above 5 % concentration of methyl gallate, the deposition of methyl gallate onto cellulose acetate membrane is saturated. The real image of CA/methyl gallate membrane fabricated can be seen in Fig. 3.

3.2. Filtration performance of membrane

Filtration performance of the membrane was evaluated using cross-flow permeation system (Fig. 4). Table 2 describes the PWF and filtration performance of neat and modified cellulose acetate membrane against 1000 ppm of oil/water emulsion. PWF measures the volume of water that passes through a membrane per unit time, area, and transmembrane pressure. As compared to the neat membrane, PWF increases by 1.15, 2, and 2.38 times for CA-1, CA-

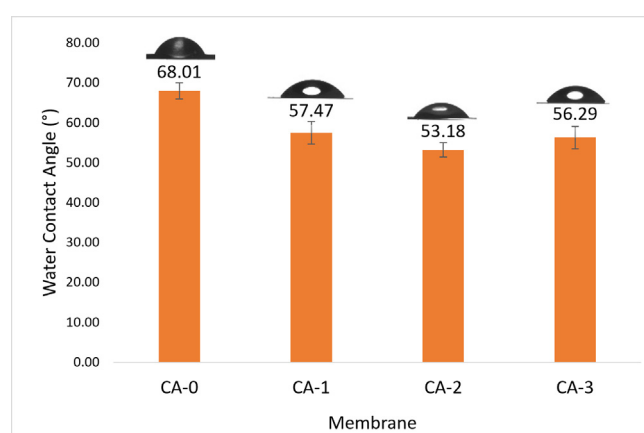

Fig. 2. Water contact angle (WCA) of neat and modified cellulose acetate membrane. 10 measurements were taken for each membrane and data were reported as mean ± SD.

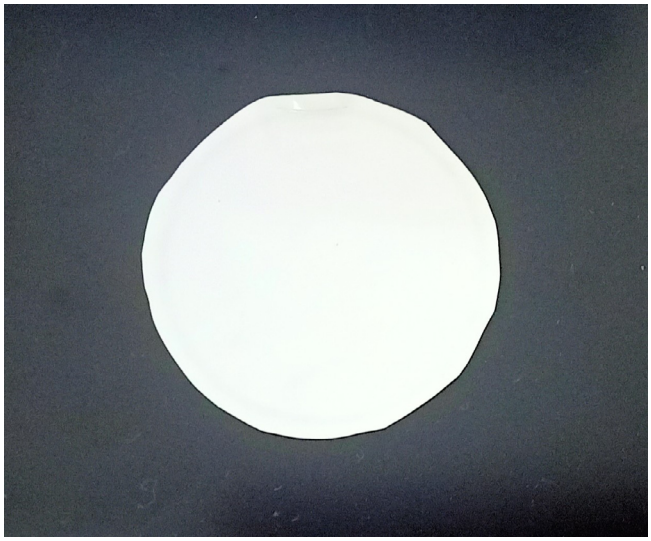

Fig. 3. CA/methyl gallate membrane developed in this study.

2, and CA-3, respectively. Increasing concentration of methyl gallate enhances the PWF. Meanwhile, against 1000 ppm of oil/water emulsion neat CA showed a relatively low flux of 16.10 ± 0.35 $Lm^{-2}h^{-1}$. The low flux for O/W emulsion is due to the oil droplets with large size blocking permeating channels and limiting the rapid permeation of water [45]. Oil flux of modified membrane is also enhanced by 1.74, 3.39, and 3.43 times for CA-1, CA-2, and CA-3, respectively in comparison with neat membrane. CA-3 membrane exhibited the highest water and oil flux among all modified membranes. The addition of hydrophilic additive was known to improve membrane flux [46]. This corresponds with the result as increasing trend is observed in membrane with increasing concentration of methyl gallate.

However, a decrease of rejection was observed in CA-3 membrane with rejection of only 96.97 ± 0.12 % while other membranes were able to maintain rejection rates at 99 %. The addition of methyl gallate as additives can accelerate solvent and non-solvent exchange during phase inversion process. This leads to an increase in macrovoids and macropores production and decreases rejection rate for oil. It is essential to develop a membrane with optimal flux without compromising the rejection rate. Therefore, CA-2 membrane showed optimum filtration performance against 1000 ppm of oil/water emulsion.

3.3. Antifouling study of membrane

Antifouling study of membrane was conducted with 4 cycles of filtration using 1000 ppm of oil/water emulsion as feed solution. Fig. 5a depicts the flux decline during 4 cycles of filtration. CA-0 membrane has the lowest initial PWF followed by CA-1, CA-2, and CA-3, respectively. Without methyl gallate, a great flux reduction was observed in CA-0 membrane with initial PWF of 28.12 ± 1.22 $Lm^{-2}h^{-1}$ and final PWF of 17.08 ± 0.93 $Lm^{-2}h^{-1}$. Lower flux reduction was observed in CA-1 and CA-2 membrane with increasing methyl gallate concentration, but not in CA-3 membrane. Although CA-3 membrane has higher initial PWF, CA-3 membrane experiences greater flux decline compared to CA-2 membrane. In the beginning, the PWF of CA-3 membrane was 66.79 ± 0.46 $Lm^{-2}h^{-1}$, while CA-2has initial PWF of 56.28 ± 2.45 $Lm^{-2}h^{-1}$. After 4 cycles of filtration, CA-3 membrane has lower water flux of 41.42 ± 1.22 $Lm^{-2}h^{-1}$ compared to CA-2 membrane of 55.37 ± 0.47 $Lm^{-2}h^{-1}$. Oversaturated distribution of methyl gallate reduce hydrophilicity making it easier for oil to adhere on membrane.

Fig. 5b illustrates fouling parameters of each membrane at the end of 4 cycles of filtration. CA-2 obtained the highest FRR with 98.73 ± 0.83 %, followed by CA-1, CA-3 and CA-0, respectively. CA-0 had the highest total fouling ratio of 67.39 ± 2.17 % followed

Fig. 4. Cross-flow permeation system set-up for filtration performance study.

Table 2
Filtration performance of neat and modified cellulose acetate membrane.

Membrane	Pure Water Flux (L $m^{-2}h^{-1}$)	Oil Flux (L $m^{-2}h^{-1}$)	Rejection (%)
CA-0	28.12 ± 1.22[c]	16.10 ± 0.35[c]	99.38 ± 0.03[a]
CA-1	32.20 ± 1.87[c]	28.05 ± 1.23[b]	99.02 ± 0.05[b]
CA-2	56.28 ± 2.10[b]	54.61 ± 0.71[a]	99.14 ± 0.03[b]
CA-3	66.79 ± 1.77[a]	55.29 ± 2.17[a]	96.97 ± 0.12[c]

All experiments were conducted in triplicate and data were reported as mean ± SD.

by CA-3, CA-1 and CA-2. By comparing the R_r and R_{ir} of the membrane, it can be observed that irreversible fouling is more prevalent in CA-0 and CA-3 membrane, while reversible fouling is more prevalent in CA-1 and CA-2. Cleaning can quickly remove reversible fouling, which manifests as a gel cake layer, however irreversible fouling is challenging to clean even with chemical cleaning [47]. These results correspond to the wettability result described earlier. Reduction in hydrophilicity lead to reduction in oil desorption and reduces antifouling property of membrane. Although CA-1 and CA-3 have similar degree of hydrophilicity, PWF of CA-3 is 2 times higher than that of CA-1 membrane which indicates the difference in pore size. Pore size that is larger than the water capillary length hinders the formation of water layer allowing oil to easily break through the intrusion pressure leading to loss of separation [48]. The compromised oil–water separation performance made CA-3 lose its filtration performance at a higher rate, allowing foulants to proliferate more widely. According to the findings, CA-2 membrane exhibited the best antifouling and filtration performance for oil/water separation. The application of methyl gallate has become a useful tool in mitigating membrane fouling.

4. Conclusion

Oil fouling could easily build-up during oil–water filtration. Hence, the development of membrane that can mitigate oil fouling is beneficial to reduce operational cost. Methyl gallate have been successfully used to develop cellulose acetate membrane with good antifouling property. CA-2 membrane showed excellent filtration performance with PWF of 56.28 ± 2.10 $Lm^{-2}h^{-1}$ and rejection rate of 99.14 ± 0.03 %. It can also maintain FRR of 98.73 ± 0.83 % after 4 cycle of filtration against 1000 ppm oil/water emulsion.

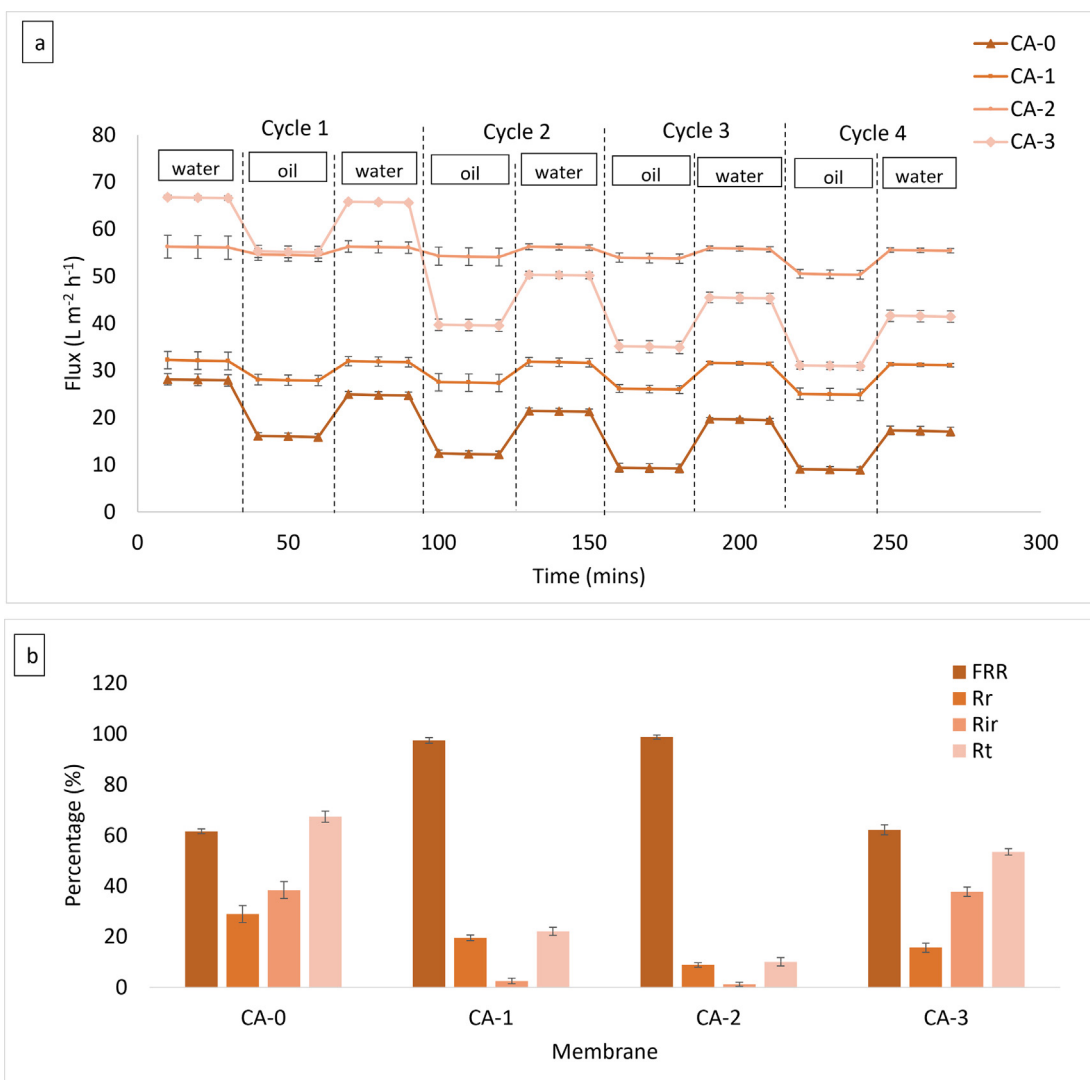

Fig. 5. (a) Flux decline and (b) fouling parameters of membrane after 4 cycles of antifouling study. All experiments were conducted in triplicate and data were reported as mean ± SD.

CRediT authorship contribution statement

Vania Septa Anggraeni: Conceptualization, Formal analysis, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. **Putu Doddy Sutrisna:** Supervision, Conceptualization, Methodology, Writing - review & editing. **Goh Pei Sean:** Supervision, Conceptualization, Methodology, Writing - review & editing. **Eric Chan Wei Chiang:** Conceptualization, Supervision, Methodology, Validation, Writing - review & editing. **Wong Chen Wai:** Conceptualization, Supervision, Validation, Funding acquisition, Methodology, Project administration, Writing - review & editing.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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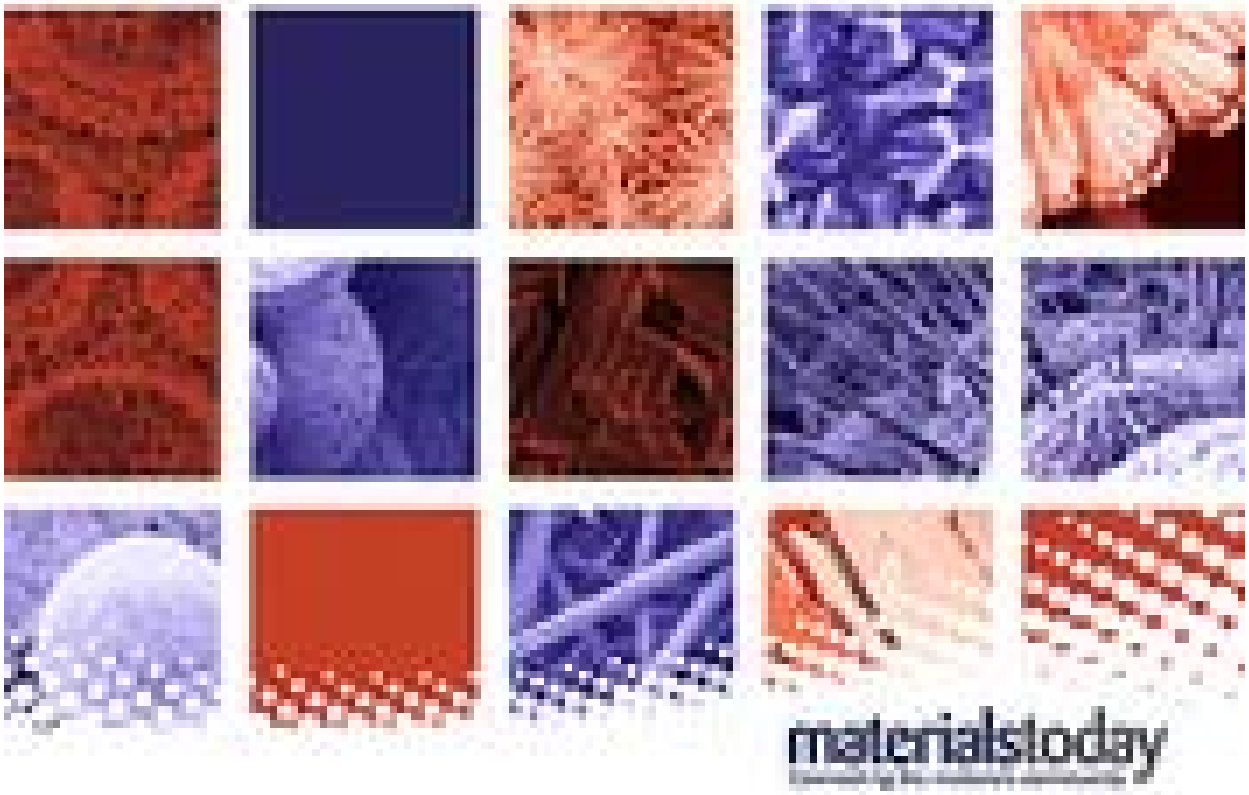

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Materials Today: Proceedings

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Universidad Complutense de Madrid (Spain) Universidad de Alicante (Spain)

Scimago Institutions Rankings

H INDEX	PUBLICATION TYPE	ISSN
69	JOURNAL	22147853

COVERAGE	INFORMATION
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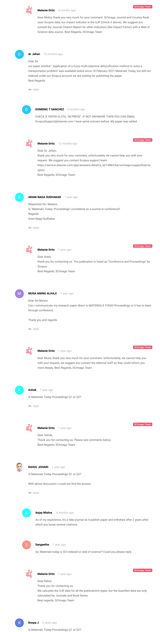

Ashish Kumar 3 months ago

Dear Journal Materials Today: Proceeding, we are organizing a conference in the month of November 2022 and want to journal to publish our proceedings. Would you be consider?

↳ reply

Materials Today 3 months ago — Editor's Choice

Dear Ashish,
Thank you for contacting us.
We are sorry to tell you that SCImago Journal & Country Rank is not a publication. It JR is a portal that provides analytical services based on the information from Scopus.
We suggest you contact the journal editorial staff, as they could inform you more deeply.
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Maria Gayle 3 months ago

Hello and greetings, I have published a paper in this journal, but my university requested my impact factor. I know that this journal is not yet eligible for Scopus if, if you know where I can obtain this information please let me know.

↳ reply

M. Jafari 3 months ago

Dear sir
In the paper entitled " Application of a fuzzy multi-objective artificial bee colony in solve a transportation problem" was available online since 10 February 2021 Materials Today, but still not indicated under our Scopus account we are waiting for publishing the paper.
Best Regards

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ANISH SAGAR SUDHAKAR 1 year ago

Responsed for Mabaim,
In "Materials Today: Proceedings" considered as a journal or conference?
Regards
Anish Sagar Sudhakar

↳ reply

Materials Today 1 year ago — Editor's Choice

Dear Sagar,
Thank you for contacting us. The publication is listed as "Conference and Proceedings" by Scopus.
Best Regards, SCImago Team

NEYA ANNN ALIALE 1 year ago

Dear Sir/Mam
I am a postgraduate only research paper direct to MATERIALS TODAY Proceedings or it has to been through conference.
Thank you and regards

↳ reply

Materials Today 1 year ago — Editor's Choice

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JuCai 2 year ago

Is Materials Today Proceedings Q1 or Q2?

↳ reply

Materials Today 2 year ago — Editor's Choice

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Hamid_Jalaeian 2 year ago

Is Materials Today Proceedings Q1 or Q2?

With above discussion I could not find the answer.

↳ reply

Anja Weber 3 months ago

Do all the statements of a field journal be in publish paper and enthrone after 1 years after which you loose several citations.

Sangeetha 1 year ago

Sir, Materials today is SCI indexed or web of science? Could you please reply

Materials Today 1 year ago — Editor's Choice

Dear Sangeetha,
Thank you for contacting us.
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Rosa J 2 year ago

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↳ reply

Materials Today 2 year ago — Editor's Choice

Dear Rosa,
Thank you for contacting us. Please see comments below.
Best Regards, SCImago Team

K HAMID 2 years ago

Dear Sir,
I'd like to inquire if Materials Today: Proceedings Q2 journal ?

↳ reply

Materials Today 2 years ago — Editor's Choice

Dear K Hamid,
Thank you for contacting us. Please see comments below.
Best Regards, SCImago Team

Nathan A. Hendon 2 years ago

Dear sir/mam
In paper entitled "Demographic analysis: gp global migration" was available online since 23 may 2021 we are waiting for publishing the paper.
Best Regard

↳ reply

Materials Today 2 years ago — Editor's Choice

Dear Nathan,
Thank you for contacting us. Could you please request a title list or your comment?
Best Regards, SCImago Team

allen Tyler 2 years ago

Hello
What is the current quartile of that journal (based on the July Data)?

↳ reply

Rana Al Ghadi 3 years ago

I have the same question, what is the Q-order of 2020 for this journal please?

Materials Today 2 years ago — Editor's Choice

Dear Rana,
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Materials Today 3 years ago — Editor's Choice

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Rajesh Kumar 3 years ago

Dear Sir
What is the ranking of Materials Today: Proceedings
Thanks

↳ reply

Materials Today 3 years ago — Editor's Choice

Dear Rajesh,
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Best Regards, SCImago Team

Dr Hemavamsy 3 years ago

What is the impact factor of material today proceedings

↳ reply

Materials Today 3 years ago — Editor's Choice

Dear Dr Hemavamsy,
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jamal kumar 3 years ago

Dear sir
Kindly provide recent material today: proceeding journal (a Scopus indexed journal)
Thanks

↳ reply

Materials Today 3 years ago — Editor's Choice

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Unfortunately Materials Today: Proceedings is no longer indexed in Scopus (Elsevier is their last quartile was for SCImago including the Coverage) since year 2020. Thus, 100 % of 2020 has been released on 17 May 2021. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.
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Sanjay Kumar Suman 3 years ago

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and
(4) Material Today Proceedings (ISSN 2214-7853)
are scopus indexed or present?

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↳ reply

Materials Today 3 years ago — Editor's Choice

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Dr Hemavamsy 3 years ago

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Thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (the Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

Prasad Kanna 3 years ago

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Materials Today 3 years ago — Editor's Choice

Dear Prasad,
Thank you very much for your comment.
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Dr. Chandra Shekhar Yadav 3 years ago

Dear sir/madam

What is the impact factor of this journal.

↳ reply

Materials Today 3 years ago — Editor's Choice

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raj kumar 3 years ago

Is it SJR or SJI

↳ reply

Materials Today 3 years ago — Editor's Choice

Dear Raj,
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Jafar Khalid Khalid 2 years ago

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Irene Brice 2 years ago

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Melanie Ortiz 2 years ago

Dear Irene,
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Sonaan Singh 2 years ago

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Melanie Ortiz 2 years ago

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Digvijay Singh 2 years ago

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Melanie Ortiz 2 years ago

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Unfortunately, we cannot help you with your request.
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Dr. S. PUTHILINI 2 years ago

Dear Sir/Madam,

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Melanie Ortiz 2 years ago

Dear Dr. S. Puthilini,
Thank you for contacting us.
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Melanie Ortiz 2 years ago

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Melanie Ortiz 2 years ago

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Ashwaq 2 years ago

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Best regards

Reply

Melanie Ortiz 2 years ago

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SCImago Team

Prathees 2 years ago

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Is how much time I can get acceptance???????????

My work is new on materials and audience will love to read
This work includes new things done by very few researchers

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Melanie Ortiz 2 years ago

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Unfortunately, we cannot help you with your request.
Materials Today: Proceedings is a peer-reviewed journal. SJR is a journal with sentimental indicators of journals indexed in Elsevier's Scopus. Unfortunately, we cannot help you with your request, we suggest you contact the journal's editorial staff, as they could inform you more details.
Best Regards, SCImago Team

Materials Today: Proceedings is indexing in Scopus? 2 years ago

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Melanie Ortiz 2 years ago

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Ardal 2 years ago

Sir,
What is the scopus source code of Materials today Proceedings journal?

Reply

Melanie Ortiz 2 years ago

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Sukhwinder Bilgander 2 years ago

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Best Regards, SCImago Team

P sarasvathi reddy 2 years ago

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Thank you...

Reply

Melanie Ortiz 2 years ago

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Thank you for contacting us. Please see comments below.

Best Regards, SCImago Team

Ahmad Al-Rawabdeh 2 years ago

Dear Sir/Madam
Why materials today proceedings didn't accept for quartile? please.

Regards
Ahmad

Reply

Melanie Ortiz 2 years ago

Dear Ahmad,
Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartiles data are only calculated for Journals and Book Series.
Best Regards, SCImago Team

M. Anthan Sai 2 years ago

Materials Today: Proceedings is indexing in Scopus?

Reply

Sham CHRAIBI 2 years ago

yes dear Anthan Sai

Reply

Melanie Ortiz 2 years ago

Dear Dr. Anthan,
Thank you very much for your comment.
All the everything more been provided by Scopus. Elsevier is their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 11, 2020. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.
Best Regards, SCImago Team

A Sankar 2 years ago

may I know, whether this journal is approved by ugc or, ugc care list?

Reply

Melanie Ortiz 2 years ago

Dear A. Sankar,
Thank you for contacting us. SJR is a journal with sentimental indicators of journals indexed in Elsevier's Scopus. Unfortunately, we cannot help you with your request referring to the index status. We suggest you consult Scopus database (see the current status of the journal) or the mentioned database for further information. You can also check that information in the journal's website or contact directly with the editorial staff. Best Regards, SCImago Team

Mahmud Ashraf 2 years ago

Why a conference proceedings is not in the Scopus indexed? Please, contact me if I am wrong.

Reply

Melanie Ortiz 2 years ago

Dear Mahmud, thanks for your participation! Our data comes from Scopus and the Publication has been classified in Conference and Proceedings publication type by Scopus. Elsevier is their last update sent to SCImago, including the Coverage's period data. https://service.elsevier.com/app/answers/detail/a_id/14600/kw/scopus+suggest%2Ccover+letter/
Best Regards, SCImago Team

Abhishekar Mishra 2 years ago

Dear Sir,
Which is more first materials today proceedings is in which quartile?

Reply

Melanie Ortiz 2 years ago

Dear Abhishekar,
Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartiles data are only calculated for Journals and Book Series.
Best Regards, SCImago Team

Deepak kumar 2 years ago

what is the impact factor of this journal?

Reply

Mahmud Ashraf 2 years ago

This is NOT a JOURNAL, as far as i understand.

Reply

Melanie Ortiz 2 years ago

Dear user, SCImago Journal and Country Rank uses Scopus data, our impact calculator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Reports or Scopus database for impact factors and a Web of Science data source. Best Regards, SCImago Team

Ronak 2 years ago

I want to know the quartile of this journal? What is meaning by not specified yet?

Reply

Jody Brim 2 years ago

Good journal

Reply

Jody Brim 2 years ago

Ok

Reply

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The aims of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

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