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To cite this article: P Setyopratomo *et al* 2018 *IOP Conf. Ser.: Mater. Sci. Eng.* **316** 012009

IOP Conf. Series: Materials Science and Engineering **316** (2018) 012009 doi:10.1088/1757-899X/316/1/012009

Carbon nanotubes shynthesis in fluidized bed reactor equipped with a cyclone

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Abstract. This work aimed to observe the performance of a fluidized bed reactor which was equipped with a cyclone in the synthesis of carbon nanotubes (CNT) by chemical vapor deposition. Liquefied petroleum gas with a constant volumetric flow rate of 1940 cm^3/minutes was fed to the reactor as a carbon source, while a combination of metal components of Fe-Co-Mo supported on MgO was used as catalyst. The CNT synthesis was carried out at a reaction temperature which was maintained at around 800 – 850 ^oC for 1 hour. The CNT yield was decreased sharply when the catalyst feed was increased. The carbon efficiency is directly proportional to the mass of catalyst fed. It was found from the experiment that the mass of as-grown CNT increased in proportion to the increase of the catalyst mass fed. A sharp increase of the mass percentage of carbon nanotubes entrainment happened when the catalyst feed was raised from 3 to 7 grams. Agglomerates of carbon nanotubes have been formed. The agglomerates composed of mutually entangled carbon nanotubes which have an outer diameter range 8 – 14 nm and an inner diameter range 4 – 10 nm, which confirmed that the multi-walled carbon nanotubes were formed in this synthesis. It was found that the mesopores dominate the pore structure of the CNT product and contribute more than 90 % of the total pore volume.

1. Introduction

In the development of nanotechnology, carbon nanotubes (CNT) lately have become a particular concern of researchers and industrial communities. CNT have led to the development of intensive research in the field of science and technology due to their superior physical and chemical properties such as superior mechanical strength, excellent electron conductivity and other superior surface properties [1,2]. Based on the way how the energy source is introduced, three methods of synthesizing carbon nanotubes which have been widely developed are arc discharge, laser ablation and chemical vapor deposition (CVD) [3].

Among the three methods of synthesis, the CVD method is the most easily adapted for large-scale production in industrial applications since it requires lower reaction temperatures to produce at a low cost and provide high carbon nanotubes yield [4,5]. In the synthesis of carbon nanotubes by CVD method, the growth mechanism involves the decomposition of carbon source compounds into carbon atom [6].

In the presence of a catalyst, such carbon atom then deposited to form a structure of carbon nanotubes. The structure of the carbon nanotubes includes the wall number, diameter, length, orientation, and alignment, can be controlled by setting the reaction parameters during the growth of the carbon nanotubes [7]. Various carbon sources such as CH_4, CO, H_2/CO, C_2H_2, C_2H_4, and C_6H_6 have been widely used for the synthesis of carbon nanotubes by CVD method [8,9].

To date, fluidized bed reactor is considered as the most superior reactor type for large-scale production of carbon nanotubes due to the availability of sufficient space to stimulate the rapid growth of the carbon nanotubes, superior in facilitating excellent heat and mass transfer, easy to scale-up and suitable for continuous production [10,11]. Moreover, fluidized bed reactor provides a high space velocity which would trigger the achievement of a high carbon nanotubes yield [12]. Lately, the development of the synthesis of carbon nanotubes by CVD method using a fluidized bed reactor has focused on mass production [13]. Therefore, the capacity of a fluidized bed reactor during the synthesis of carbon nanotubes becomes a very important parameter.

In this work, we present the performance of a fluidized bed reactor which is equipped with a cyclone in synthesizing carbon nanotubes by CVD method. In this study it has been shown that with the use of cyclone the reactor is capable of synthesizing CNT with a high enough capacity which reach 23.39 g as-grown CNT per batch. The main observed parameters is the carbon nanotubes yield and the reactor capacity. The reactor capacity is represented by the mass of as-grown carbon nanotubes which are produced in a single batch operation. The carbon efficiency and some physical characteristic include the orientation, the morphology and the bulk density of the carbon nanotubes product are also investigated.

2. Experimental

2.1. Catalyst preparation

The combination of the transition metals Fe, Co and Mo which were supported on MgO was used as a catalyst in this work. Fe and Co act as the active components, while the role of the Mo component is as a promoter and to prevent rapid deactivation of the catalyst [14-17]. The catalyst was prepared using a wet impregnation method [8]. Ferric (III) nitrate nonahydrate ($Fe(NO_3)_3.9H_2O$), cobalt (II) nitrate ($Co(NO_3)_2.6H_2O$), ammonium heptamolybdate tetrahydrate ($(NH_4)6Mo_7O_{24}.4H_2O$) and magnesium oxide (MgO) were used as metal precursors. The catalyst was prepared to achieve a weight percent composition of Fe:Co:Mo:MgO (4:4:2:90).

2.2. The reactor

The fluidized bed reactor arrangement was schematically presented in figure 1. The reactor was made of a quartz tube 95 cm in height, 2.60 cm inner diameter and 0.20 cm thick. A tubular electric furnace which capable to supply 1.2 kW heat covered the reactor. The furnace was equipped with a temperature controller and able to raise the temperature of the furnace up to 900 °C. A K-type (chromel-alumel) thermocouple was embedded between the inner surface of the furnace and the outer surface of the reactor tube and serves to detect the furnace temperature.

A cyclone, which was made of stainless steel SS 304 having a diameter of about 7.8 cm and volume of about 1000 cm^3, was mounted on the top of the reactor. It is connected to the reactor exit gas line. The cyclone serves to separate the fine carbon nanotubes particles which were carried by the flowing gas out of the reactor. A thin plate, which is made of quartz porous material with a pore size of 400 mesh, was fitted at a distance 54 cm above the bottom of the reactor tube. It serves as a gas distributor and to retain the catalyst/product carbon nanotubes. The area under the quartz plate is a preheating zone, while the area above the quartz plate is a reaction zone. A certain amount of quartz wool was placed on a quartz plate that serves to avoid blockage of the quartz plate pores due to the growth of the carbon nanotubes.

2.3 Experimental procedure

The experiments were performed in a constant volumetric rate of feed gas mixture. The total feed gas flow rate was 1940 cm^3/minutes which consist of 77%vol argon, 13 %vol liquefied petroleum gas (LPG) and 10 %vol hydrogen. The furnace temperature was maintained at 900 ° C. While the amount of calcined catalyst fed was varied at 3, 5, 7 and 9 grams.

After reduced catalyst was fed to the reactor, reduction stage was started by flowing the hydrogen at a flow rate of 500 cm^3/minutes. The catalyst reduction process was held for 5 hours at furnace temperature 750 °C. Then the furnace temperature was raised to 900 °C. After the furnace temperature reach 900 °C, the synthesis of carbon nanotubes was started by introducing the feed gas mixture to the reactor while maintaining the furnace temperature at 900 °C. The synthesis reaction is terminated by stopping the flow of LPG gas. The furnace was then switched off and the reactor was cooled by flowing argon gas. As grown carbon nanotubes were removed from the reactor as well as from the cyclone and were stored for analysis.

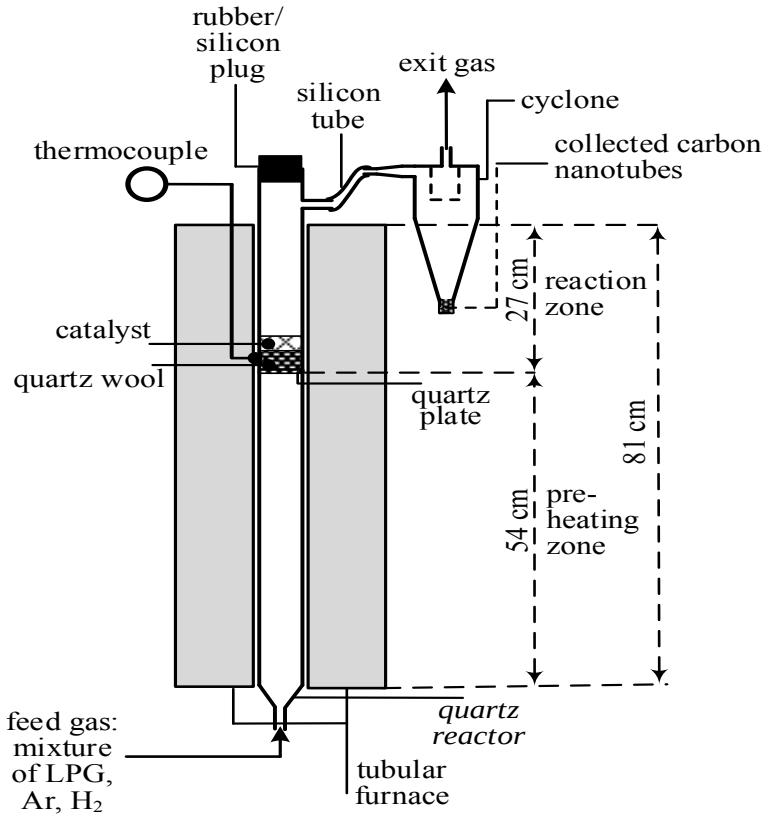

Figure 1. The schematic of fluidized bed reactor arrangement

2.4 Characterization techniques

The orientation of the CNT product was analyzed using scanning electron microscope - JSM-6510A/JSM-6510LA (Analytical/Analytical low vacuum SEM). While transmission electron microscope, TEM JEOL JEM 1400, were used to observe its diameter and morphology. The BET surface area and pore characteristic of the CNT were analyzed using Surface Area Analyser, Quanta chrome Nova 2000 Series - NovaWin - Instruments version 11.03.

3. Results and discussions

3.1 The CNT yield and the carbon efficiency

In this work, the CNT yield is defined as the mass of carbon nanotubes produced per unit mass of catalyst fed. The profile of the CNT yield at various of catalyst mass fed was presented in figure 2. It

can be seen that a sharp decrease in the CNT yield occurs when the catalyst feed was increased, that is from 3.61 g CNT/g catalyst at 3 grams catalyst feeding to 1.88 g CNT/g catalyst at 7 grams catalyst feeding. The availability of space for the growth of carbon nanotubes become a significant contributing factor in increasing the growth rate of the carbon nanotubes. The more the amount of catalyst fed will result in the less ratio of the available space for the carbon nanotubes growth to the mass of the catalyst. Thus it can be understood as the amount of catalyst feed is raised, then the CNT yield decreased. It should be noted that decreasing the CNT yield is associated with lowering the quality of CNT in regard to increasing the level of impurities content derived from the residual catalyst. Further addition of catalyst feed to 9 grams resulted in a slighter decrease in CNT yield to 1.60 g CNT/g catalyst. At high catalyst feeding ratio of the available space for the carbon nanotubes growth to the mass of the catalyst will be very low resulted in denser growing carbon nanotubes particles. This dense particle will create more intense collisions between particles and inhibit the occurrence of particles entrainment. Consequently, there will be more particles of carbon nanotubes have enough time to grow then avoid a sharp drop in CNT yield.

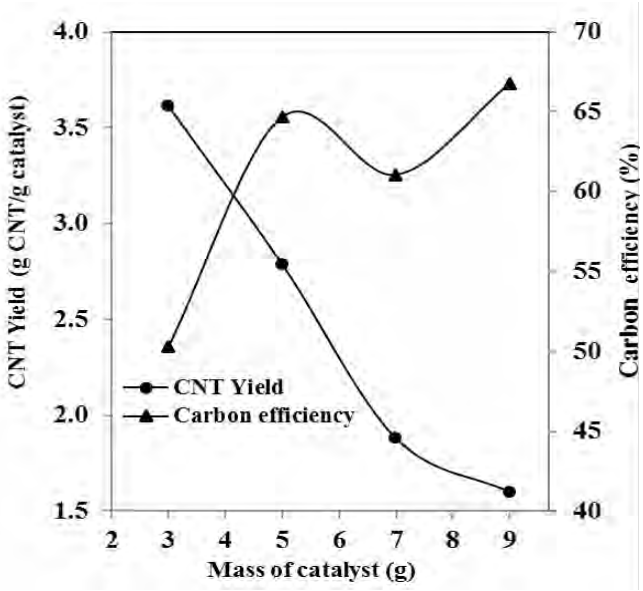

Figure 2. The CNT yield and carbon efficiency in various catalyst feed

The carbon nanotubes yield resulting from this work is comparable to the yields obtained by Zhang et al. [18] which is 3.8 g CNT/g catalyst and relatively greater than the yield achieved by some other researchers, i.e. Baddour et al. [19]: 0.96 g CNT/g catalyst, Huang et al. [20]: 1.48 g CNT/g catalyst, Danafar et al. [21]: 0.6-0.8 g CNT/g catalyst, Zhao, et al. [22]: 0.22 g CNT/g catalyst, and Hsieh et al. [23]: 0.7-3.0 g CNT/g catalyst. Figure 3 also expose the carbon efficiency in accordance with the amount of catalyst fed. The carbon efficiency is defined as the percentage of the amount of carbon available in the feed gas which is converted into carbon nanotubes. The liquefied petroleum gas which was used in this work has a chemical composition as follow: 1.7 %mol C_2H_6, 71.7 %mol C_3H_8, 11.4 %mol i-C_4H_{10} and 15.2 %mol C_4H_{10}. From these data, the available carbon which was supplied to the reactor will be 23.51 g carbon/hour. Base on these amount of the available carbon and the amount of CNT produced at the end of synthesis, the carbon efficiency was calculated.

In general, the carbon efficiency is directly proportional to the mass of catalyst fed. This can be explained that the more the mass of catalyst in the reactor, the contact time between the gas feed and the catalyst will be longer so that the conversion of hydrocarbons into carbon nanotubes will be

higher. In this work, the highest carbon efficiency was 66.8% which was achieved when the mass of catalyst feed was 9 grams. From an economic viewpoint, a higher carbon efficiency is preferred because it reflects more efficient carbon source utilization. The carbon efficiency resulting in this work are comparable to those obtained in fluidized bed reactor studied by some other researchers, among others Morancais et al. [24] obtained carbon efficiency 48 - 75 % using Fe/Al_2O_3 catalyst at 450 -750 ^oC, while Venegonia et al. [25] got carbon efficiency 15-50 % applying $Fe\text{-}SiO_2$ catalyst at 750 -1350 ^oC.

3.2 The reactor performance and the CNT entrainment

Reactor capacity indicates how much the ability of the reactor for producing carbon nanotubes in one batch operation. The capacity of the reactor is a very important parameter for commercial-scale production applications since it will determine the economic level of the reactor operation. In this work, reactor capacity was expressed as mass of as-grown carbon nanotubes that can be produced in a single batch synthesis process. In this case, a mass of as-grown carbon nanotubes is a mass of carbon nanotubes obtained from the reactor at the end of the synthesis reaction, it includes the mass of the catalyst. Mass of as-grown CNT produced at various of catalyst mass feeding was presented in figure 3. It was shown that mass of as-grown CNT increase in proportion to the increase of the catalyst mass fed. It also can be seen that the reactor is capable of producing as much 23.4 grams as-grown in one batch synthesis when catalyst feed is 9 grams. It should be noted that the capacity of the produced as-grown carbon nanotubes was also counted the as-grown nanotubes products which were carried by exit gas stream (called as carbon nanotubes entrainment) and were separated by the cyclone.

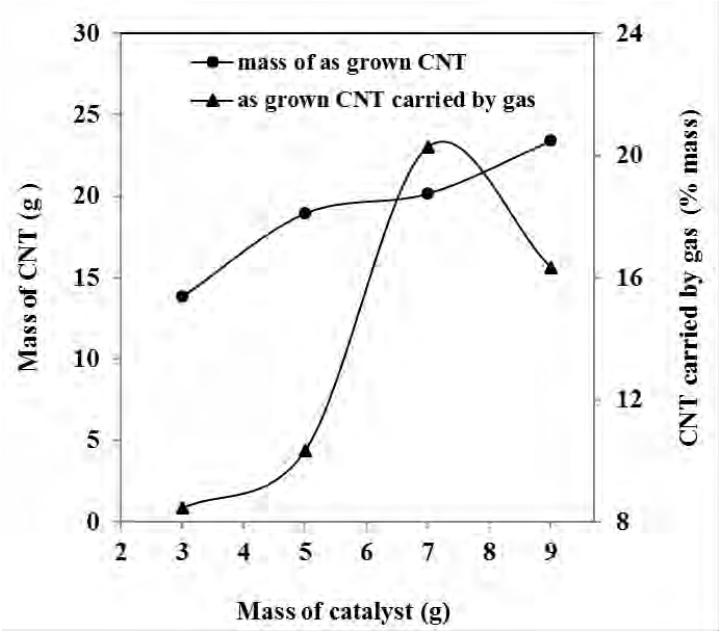

Figure 3. Mass of as-grown the CNT produced in various catalyst feed and the percentage which were carried by the flow of gas exit the reactor

Observations which was conducted during the experiment found that the entrainment of partly carbon nanotubes in the gas stream only occurs especially in a short time interval just after the synthesis reaction begins. It shows that the carbon nanotubes are in the early growth phase and are at the top section of the fluidized bed, such particles still have a small size so that it easily carried by the flow of gas.

The percentage of as-grown carbon nanotube entrainment which were separated in the cyclone was also shown in the figure. It can be seen in the figure that a sharp increase of the mass percentage of

carbon nanotubes entrainment happened when the catalyst feed was raised from 3 to 7 grams. The lowest percentage of carbon nanotubes entrainment is 8.5 % mass when catalyst feed is 3 grams, and its highest value reaches 20.3 % mass which happens at 7 grams catalyst feeding. It indicates that the addition of an amount of the catalyst feed to a certain extent causes increasing the formation of carbon nanotubes with smaller particle size. The smaller the particle size of carbon nanotubes will be the greater the potential to be carried by the flow of gas. The experimental results also showed that further addition of catalyst feed from 7 to 9 grams decreased the percentage of carbon nanotubes entrainment. Adding a further amount of the catalyst feed will shorten the distance between the fluidized particles in the reactor chamber leading to the greater chance of collisions among the growing carbon nanotubes particles. The particles collision will become the barrier for the small particles of carbon nanotubes to be carried by the flow of gas out of the reactor.

3.3 The CNT orientation and morphology

The orientation of CNT product can be observed from SEM image with a magnification of 5,000 times which was presented in figure 4. From that figure, it can be observed that the agglomerates of carbon nanotubes have been formed in synthesis with the fluidized bed reactor. From the image can also be observed that each CNT agglomerate was composed of several smaller size sub-agglomerate. The orientation of carbon nanotubes is mutually entangled with each other to form a sub-agglomerate. Furthermore, during their growth carbon nanotubes in a single sub-agglomerate form a network with other sub-agglomerates then some sub-agglomerates are integrated into a bigger agglomerate.

It also can be seen that the size of an agglomerate was ranging from about 2 – 5 µm. The formation of a stable agglomerate size is certainly influenced by the interaction of the gas-solid during the occurrence of the fluidization phenomenon during the synthesis of carbon nanotubes. Clearer visualization of the orientation of the carbon nanotubes products was shown by SEM image with a magnification of 50,000 times which was presented in figure 5. From the image, it was seen more clearly that long carbon nanotubes were linked to one another to form a woven carbon nanotubes. The woven carbon nanotubes had lead to the formation of a stable agglomerate.

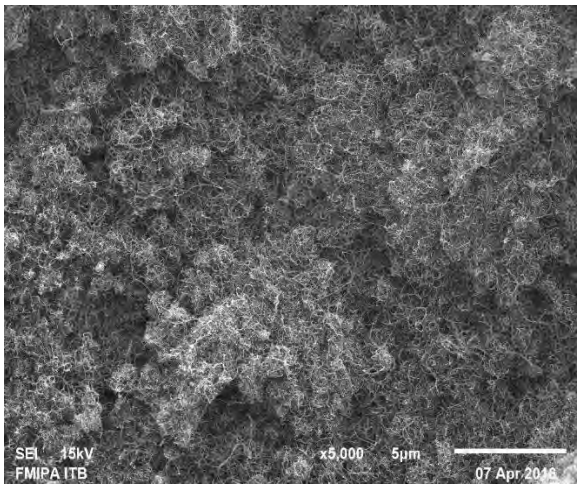

Figure 4. SEM image of the CNT at 5,000 times magnification produced with the catalyst feed 3g

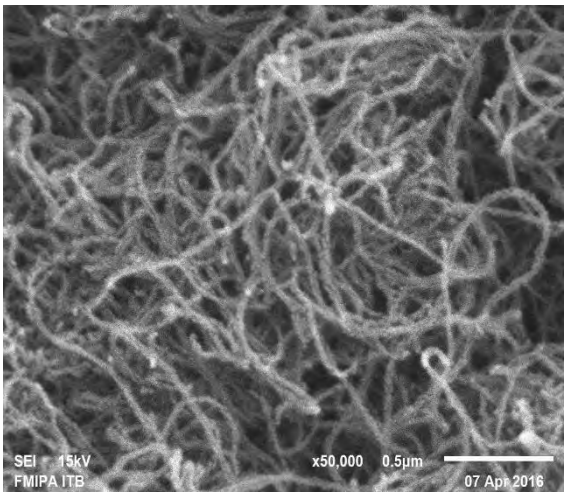

Figure 5. SEM image of the CNT product at 50,000 times magnification produced with the catalyst feed 3g

To investigate the morphology of the carbon nanotubes, TEM image capture was carried out and the results were displayed in figure 6 for synthesis with catalyst feeding 3 and 7 grams as representative

samples. By making manual measurements using a ruler on the basis on scaling shown in the images, it was found that the carbon nanotubes have an outer diameter range 8 – 14 nm and an inner diameter range 4 – 10 nm. It was confirmed that multi-walled carbon nanotubes have been formed in this synthesis. In the image was also found that a rest of catalyst particle stand at the end of carbon nanotubes. This indicated that the growth of carbon nanotubes follow the tip-growth mechanism.

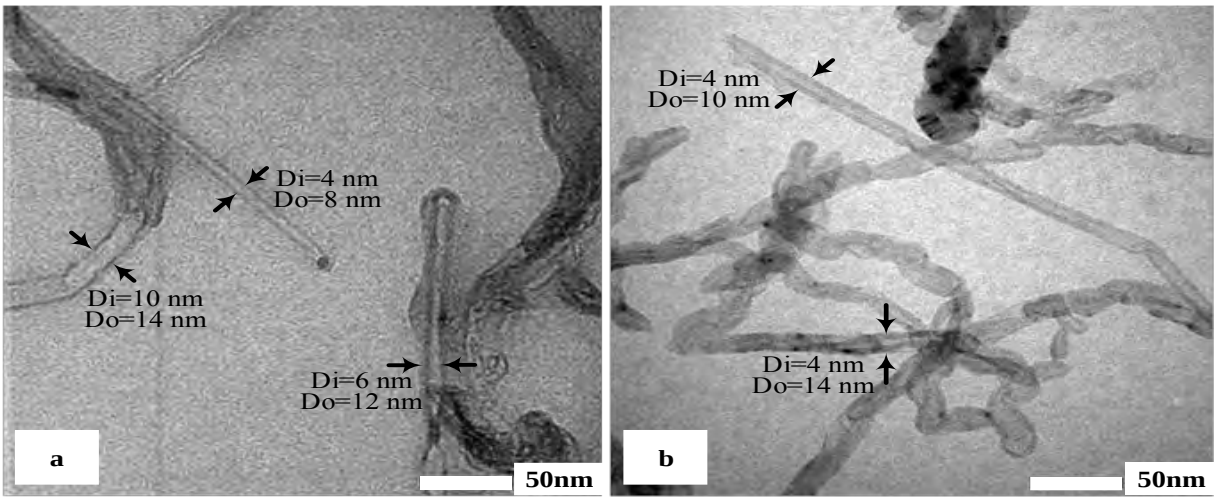

Figure 6. TEM image of the CNT produced with the catalyst feed: (a) 3g and (b) 7g

The morphology of the carbon nanotubes, resulting from the synthesis with catalyst feeding 3 and 7 grams, which were entrained by the flowing gas and collected in the cyclone were also investigated by taking its TEM image and the images were presented in figure 7. The diameter of the carbon nanotubes was measured using similar previous method applied in the determination of the diameter of carbon nanotubes which were collected from the reactor. The measurement results showed that carbon nanotubes which were carried by the gas stream have an outer diameter in the range 8 – 22 nm and inner diameters in the range 6 – 14 nm.

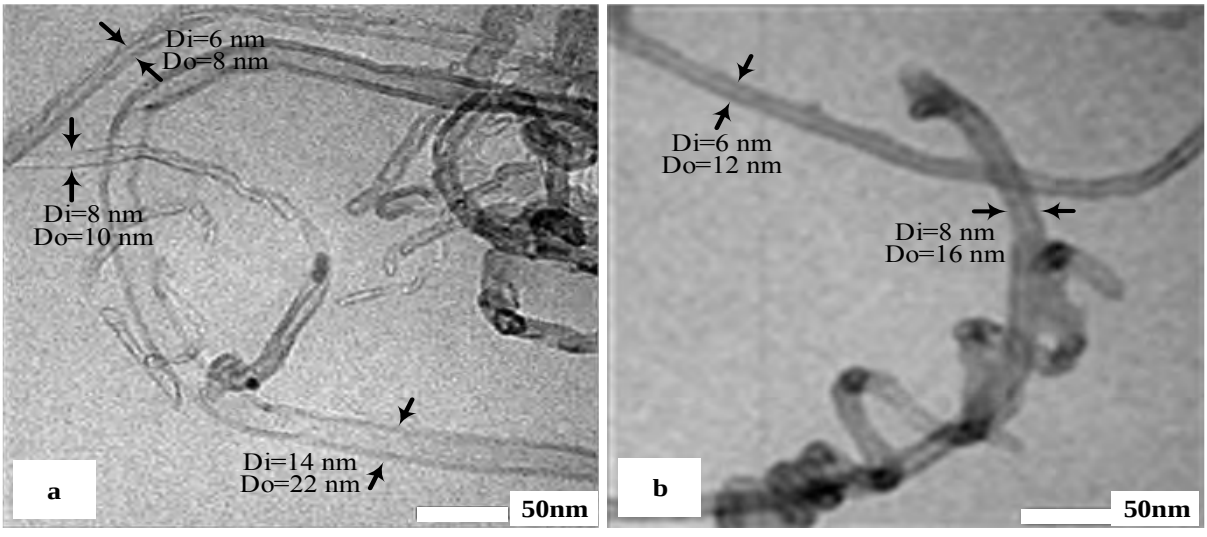

Figure 7. TEM images of the CNT carried by gas and separated in the cyclone with the catalyst feed: (a) 3g and (b) 7g

3.4 The surface area and pore volume of the CNT

Surface area and pore volume distribution were determined from the isotherm adsorption-desorption of N_2. The analysis was conducted to both CNT product which were collected in the reactor and which were carried by the gas stream and collected in the cyclone. The BET surface area was presented in figure 8, while the total pore volume was shown in figure 9. In the determination of the total pore volume, it was assumed that the pores were to be filled with liquid N_2. It was determined from the amount of nitrogen vapor adsorbed at a relative pressure P/Po ≈ 1, where Po is the N_2 saturation pressure. From both figure can be seen that CNT which were collected in the reactor have BET surface area in the range 115 - 148 m^2/g and it was higher than BET surface area of the CNT carried by gas and separated in the cyclone which is in the range 71 - 79 m^2/g. The same thing happened to the total pore volume. The CNT which were collected in the reactor have a total pore volume in the range of 0.768 – 1.531 cm^3/g and it was higher than the total pore volume of the CNT carried by gas and separated in the cyclone which is in the range of 0.513 - 0.612 cm^3/g.

The micropores (pore size < 2nm) volume distribution of the CNT product collected in the reactor, which was determined using the Horvath-Kawazoe (HK) slit model, was expressed as cumulative micropores volume and presented in figure 10. It was shown that micropores with a pore size range 0.3 – 0.5 nm dominate the micro porosity. It can be seen from the figure that experiments which were conducted by varying the mass of the catalyst resulted in CNT with micropores volume in the range 0.0468 – 0.0598 cm^3/g. The Barret, Joyner and Halenda (BJH) method was used to determine the mesopores volume distribution of the CNT product collected in the reactor. Mesopores are pores with pore size range 2 – 50 nm. The result expressed as the cumulative BJH pore volume and presented in figure 11.

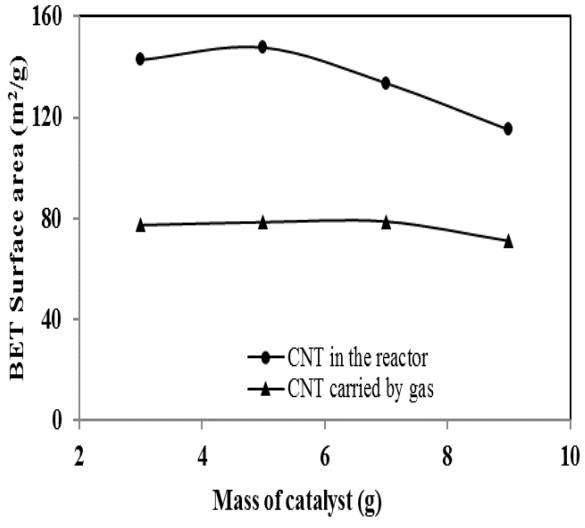

Figure 8. BET surface area of the CNT

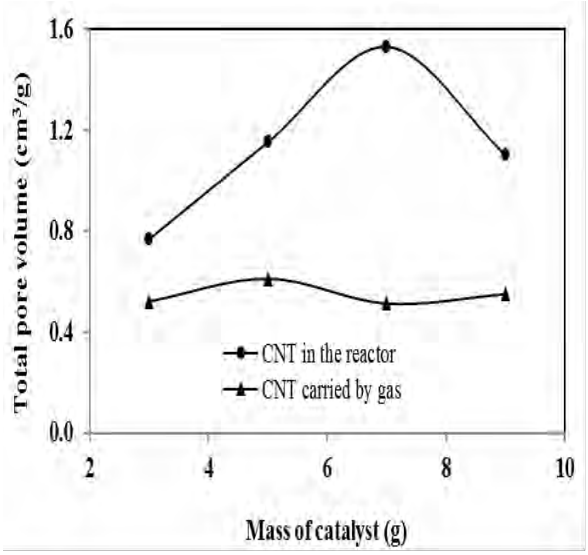

Figure 9. Total pore volume of the CNT

Even though the determination using BJH method include measurements on a limited range of macropores, but the cumulative pores volume curves tend to be flat in the macropores sizes range (pore size > 50 nm). It means that the determined pore size was dominated by the mesopores. At the level of the catalyst mass varied, the mesopores volume in the CNT product is in the range 0.7361 – 1.4933 cm^3/g. It means that the mesopores contribute more than 90 % of the total pore volume in the CNT product.

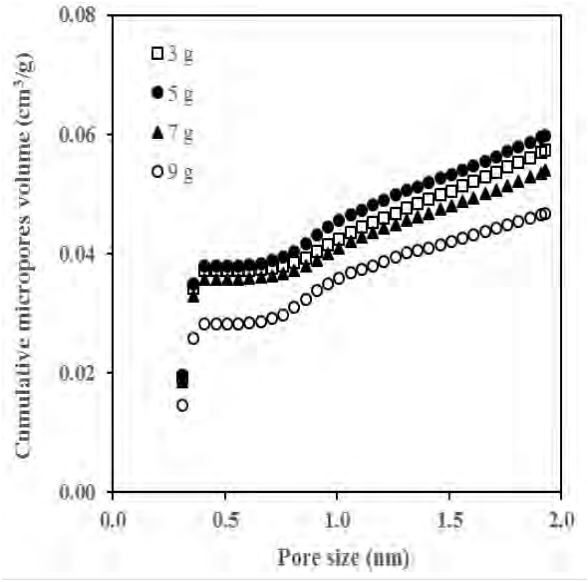

Figure 10. Cumulative micropore volume of the CNT collected in the reactor at all mass catalyst varied

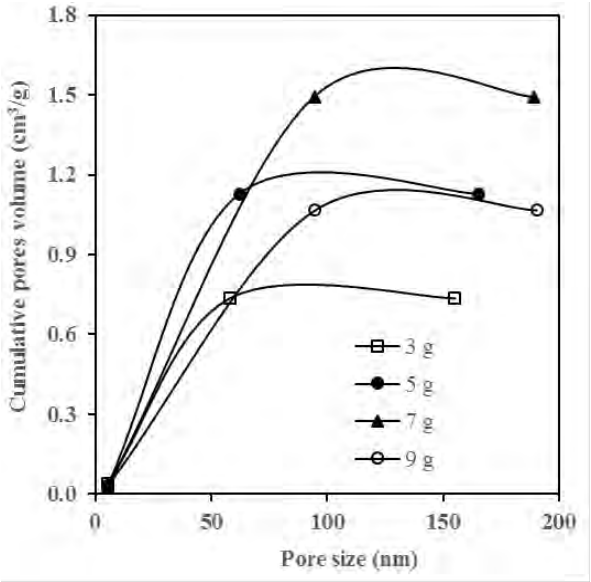

Figure 11. Cumulative BJH pore volume of the CNT collected in the reactor at all mass catalyst varied

4. Conclusions

The mass of as-grown CNT increase in proportion to the increase of the catalyst mass fed. A sharp increase of the mass percentage of carbon nanotubes entrainment happened when the catalyst feed was raised from 3 to 7 grams which indicate that the addition of an amount of the catalyst feed to a certain extent causes increasing the formation of carbon nanotubes with smaller particle size. The availability of space within the reactor for the growth of carbon nanotubes was considered become the factor that affecting the CNT yield. In general, the carbon efficiency is directly proportional to the mass of catalyst fed. Agglomerates of carbon nanotubes have been formed in synthesis using the fluidized bed reactor. The agglomerates composed of mutually entangled carbon nanotubes which have an outer diameter range 8 – 14 nm and an inner diameter range 4 – 10 nm, which confirmed that the multi-walled carbon nanotubes were formed in this synthesis. High mass catalyst feeding resulted in more dense fluidized catalyst particles and generate a more compact carbon nanotubes agglomerate. It was found that the mesopores dominate the pore structure of the CNT product.

Acknowledgement

The authors would like to thank those who have supported this work, especially The Directorate Research and Community Services, Universitas Indonesia, for providing the financial support through The Research Cluster Grant 2015.

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PUBLISHER

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PUBLICATION TYPE

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ISSN

17578981, 1757899X

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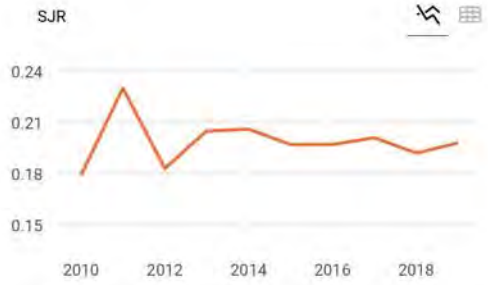

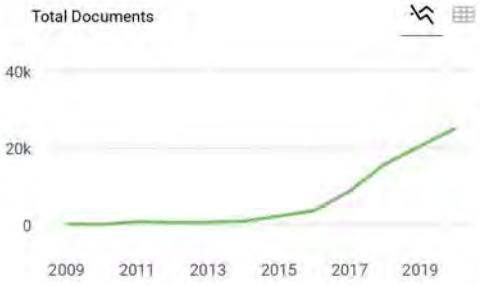

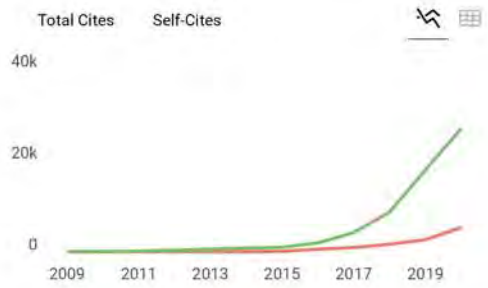

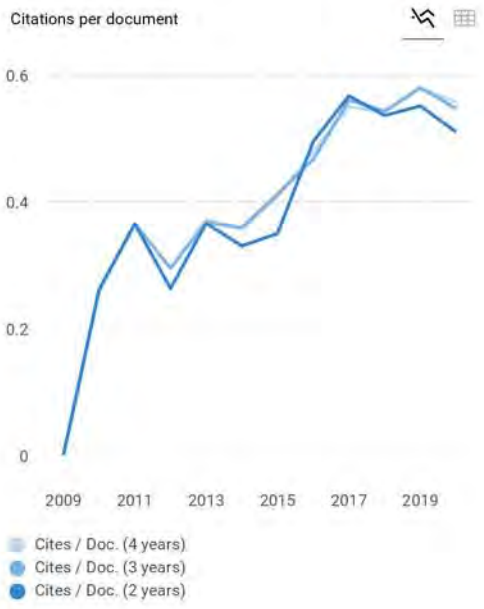

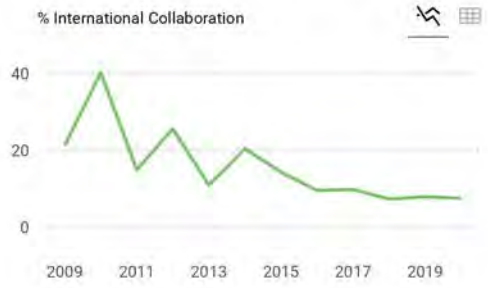

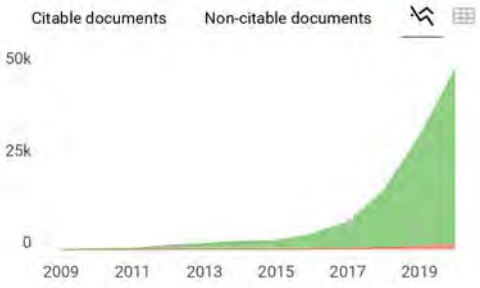

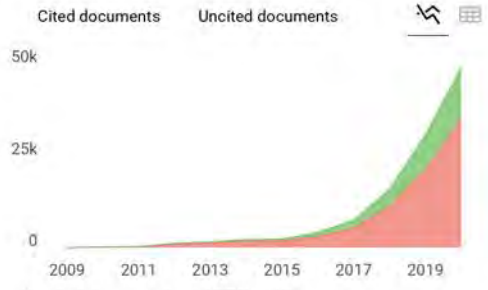

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<a href="https://www.scim

SCImago Graphica

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Metrics based on Scopus® data as of April 2021

V **Vikas Magdum** 5 months ago

Respected sir,
From which volume IOP conference Series material science and Engineering is discontinued from Scopus.
But after using following link it shown as indexed from 2007-present
https://www.scopus.com/sourceid/19700200831?origin=resultslist
Please clarify wheather it Scopus Indexed or not?

reply

SCImago Team

Melanie Ortiz 5 months ago

Dear Vikas,
Thank you very much for your comment.
All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 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.
For further information, please contact Scopus support: https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/
Best Regards, SCImago Team

V **Vikas Magdum** 5 months ago

Is IOP conference science: Material Science and Engineering is Web of Science Indexed?
Upto which volume or date IOP Material Science and Engineering journal is Scopus Indexed?

reply

SCImago Team

Melanie Ortiz 5 months ago

Dear Vikas,
Thank you for contacting us.
SJR is a portal with scientometric indicators of journals indexed in Elsevier/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.
Best Regards, SCImago Team

N **NITISH KUMAR SAINI** 5 months ago

It is again continued in Scopus, kindly recheck and verify by following link

https://www.scopus.com/sourceid/19700200831?origin=resultslist

Now kindly help me, wheather it is continued from same volume or some volumes are not covered in Scopus.
But it's good that, it's web of science indexing is continue.

reply

SCImago Team

Melanie Ortiz 5 months ago

Dear Nitish,
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/
Best Regards, SCImago Team

G **Gaurang Patel** 6 months ago

The scopus coverage of this Journal shows continue on it's website but here there is no SJR value, Why?

reply

SCImago Team

Melanie Ortiz 6 months ago

Dear Gaurang,
Thank you for contacting us.
According to the latest update sent by Scopus this year, this journal was discontinued in its database as of 2021. Therefore, it seems that they did not send us any data to calculate the scientometric indicators related to 2020 for this journal.
Best Regards, SCImago Team

H **Hassan Obaid Abbas** 8 months ago

I would like to ask if the IOP conference series:Material science and Engineering is still or discontinued for Scopus.
With regards

reply

A **Ahmed A. Thabit** 6 months ago

Discontinued in Scopus as of 2021

G **GUNUPUDI RAJESH KUMAR** 6 months ago

It is discontinued from SCOPUS. But it still indexed in CPCI-S (WoS Core Group)

L **Lateef Assi** 7 months ago

discontinued for Scopus

SCImago Team

Melanie Ortiz 8 months ago

Dear Hassan,
Thank you very much for your comment.
All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was released on 11 June 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

F **Ferit Artkın** 9 months ago

Dear Scimango Team,

Which IOP conferences in Sci expanded indexing in Engineering in 2021? May IOP material science and Engineering congress be in Sci expanded? I am interested in Mechanical Engineering especially Optical and Mechanical Measurements like Laser Technologies and Laser manufacturing ör measurements. Thanks,

Sincerely,
Ferit A., PhD

reply

SCImago Team

Melanie Ortiz 9 months ago

Dear Ferit,
Thank you for contacting us.
SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus. Unfortunately, we cannot help you with your request. We suggest you contact the WoS team for that information.
Best Regards, SCImago Team

N **Nelly** 9 months ago

Dear friends!
Please explain why in Scopus conference collections IOP Conference Series: Earth and Environmental Science, etc. have a quartile in the Citescore index, and in SJR conference materials are not assigned a quartile. Thank you for the clarification

reply

SCImago Team

Melanie Ortiz 9 months ago

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

K **KOVENDAN** 1 year ago

Dose the IOP conference series covers in scopus database or not.

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Kovendan,
Thank you very much for your comment.
All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was released on 11 June 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.
For further information, please contact Scopus support: https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/
Best Regards, SCImago Team

R **Rafael** 1 year ago

No se visualiza el cuartil, cual es el motivo?

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Rafael,

Thank you for contacting us. Please see comments below.

Best Regards, SCImago Team

V **Vo Anh Tuan** 1 year ago

Dear Melanie , Elena and SCImago team

Can you please let me know Q1/ Q2:/ Q3 or Q4 Classiffication as the journal IOP Conference Series : Materials Science and Engineering , with the Volume published as the link below:

https://iopscience.iop.org/volume/1757-899X/869

Thank you so much for your Promp reply

Warmest regards

VÕ Anh Tuấn

University of Architecture of HO CHI MINH CITY, VIETNAM
Tel: 84908226165
196 Pasteur , District 3, HCMC, Vietnam

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Vo Anh Tuan,
Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartile's data are only calculated for Journals and Book Series.
Best regards, SCImago Team

P **ptnabeel** 1 year ago

I was looking for a template to publish my paper in IOP conference series: Material Science and Engineering.

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Sir/Madam,
thank you for contacting us.
We suggest you visit the journal's homepage (See submission/author guidelines) or contact the journal's editorial staff , so they could inform you more deeply.
Best Regards, SCImago Team

H **Haydar Al-Ethari** 1 year ago

I hope this message finds you very well
I have two papers published in the IOP Conference Series: Materials Science and Engineering, Volume 881, 3rd International Conference on Sustainable Engineering Techniques (ICSET 2020) 15 April 2020, Baghdad, Iraq, but I did not find them in my id author profile in scopus and could not add them manually. Is there any problem with this publication/conference/journal? (may be out of scopus). The online publication was at 1/7/2020.
Best Regards

reply

S **Saran** 1 year ago

Hi.is there any problem in adding to scopus author profile?

SCImago Team

Melanie Ortiz 1 year ago

Dear Saran,
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/
Best Regards, SCImago Team

SCImago Team

Melanie Ortiz 1 year ago

Dear Haydar,
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/
Best Regards, SCImago Team

A **AL-Kurdhani J. M. H.** 1 year ago

Hello
Dear Elena,
I want to know what is the value of impact factor of 2019 for useful all MSC. or/and pH.D. students by publishing in these journals and my students need the Q1 or Q2 in SJR with Scopus Q-ranking to graduation.
Thank you so much.

Best Regards,

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear AL-Kurdhani,

Thank you for contacting us. Could you please tell us which particular journal you are referring to?

Best Regards, SCImago Team

V **Virat Khanna** 1 year ago

Can you please tell, how much time does IOP conference series take to publish the proceeding of the conference after the conference date.

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Virat,
thank you for contacting us.
Unfortunately, we cannot help you with your request, we suggest you contact the editorial staff , so they could inform you more deeply.
Best Regards, SCImago Team

S **syafriyudin** 1 year ago

is The journal IOP Conference Series: Materials Science and Engineering in the scopus index

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Syafriyudin,
Thank you very much for your comment.
All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 2020, 11. 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

F **Fouad Fadhil Al-Qaim** 1 year ago

Dear Sir/Madam
May I know this Journal whether Q1, Q2,Q3 or Q4? Actually, there is no any quarter reported here.
Thank you

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Fouad,
Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartile's data are only calculated for Journals.
Best regards, SCImago Team

R **Raj kamal** 1 year ago

IOP is whether scopus indexed

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Raj,
Thank you very much for your comment.
All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 2020, 11. 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

R **ramanathan venkatachalam** 1 year ago

What is impact factor of IOP Conf. Series: Materials Science and Engineering

reply

SCImago Team

Melanie Ortiz 1 year ago

Dear Ramanathan, thank you very much for your comment.
SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check out our web to localize the journal. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

A **Abbas Al-Hdabi** 2 years ago

Dear Elena
I hope that you are very well and will be safe within Corona virus crises.
Please let me know when you issue the new journal classification i.e. Q1, q2 ... and what is your strategy for your update.
My query is a general one not regarding IOP publications.

Kind regards and stay safe

Abbas

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Abbas,
Thank you for contacting us. Our data come from Scopus, they annually send us an update of the data. This update is sent to us around April / May every year. Thus, the indicators for 2019 will be available in June 2020. Best Regards, SCImago Team

B **Boumediene sadoun** 2 years ago

Hello
I want to know what is the value of impact factor of 2019.
Also, is the nature of publishing in this journal considered as an article or a processing?
In addition to this, can we take PhDs in this journal?

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Boumediene, thank you very much for your comment.
SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check out our web to localize the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. For further information about this journal, please visit the journal's website. Best Regards, SCImago Team

P **PARU** 2 years ago

IOP CONFERENCE SERIES A BOOK OR JOURNAL.

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Paru,
Thank you for contacting us.
SJR is a portal with scientometric indicators of journals indexed in Scopus. All the data have been provided By Scopus /Elsevier and SCImago doesn´t have the authority over this data which are property of Scopus/Elsevier. SCImago has a signed agreement that limits our performance to the generation of scientometric indicators derived from the metadata sent in the last update. Apparently, Scopus has categorized this publication in "Conference and Proceedings" section. We suggest you to contact with Scopus support

regarding this request:
https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/. Best Regards, SCImago Team

Hebatalrahman Hebatalrahman 2 years ago

please what is value can express impact factor for IOP conference series material science and engineering

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Hebatalrahman, thank you very much for your comment.
SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check out our web to localize the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

A **Andrei** 2 years ago

No me carga el cuartil, saben porqué se debe eso?

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Andrei,
Thank you for contacting us. We calculate the SJR data for all the publication types, but the Quartile data are only calculated for Journal type's publications. Best regards,
SCImago Team

K **Kassim** 2 years ago

Hello
I want know that is Elsevier a publisher of this journal?

reply

M **MADHU LATA BHARTI** 2 years ago

please tell me if this journal is ugc listed, if it is, what is its ugc approval number?

reply

O **Ondrej** 2 years ago

Madhu means if the journal is approved and listed in University Grants Commission of India. It is possible to find it out here (after registration):
https://ugccare.unipune.ac.in/site/website/index.aspx
However, IOP Conference Series: Materials Science and Engineering, is not, in fact, journal, but it collects proceedings from conferences, not journal articles. Still, the good thing is that

IOP CS is WOS, Scopus (SJR) indexed. Generally, IOP publishing house is fair and reilable institution.

SCImago Team

Melanie Ortiz 2 years ago

Dear user, thanks for your participation! Best Regards, SCImago Team

SCImago Team

Melanie Ortiz 2 years ago

Dear Madhu, could you please expand your comment? Best Regards, SCImago Team

O **osamah raad** 2 years ago

please how can I know the dates future conferences of IOP? are there any website for that purpose?
Regards

reply

K **Kabiru** 2 years ago

Dear Elena,
If IOP is a conference, then papers published in it are Scopus journal articles or just conference papers?
I was told that the papers published in IOP: material science and engineering are Scopus indexed journal papers with Scopus Q-ranking.
We need this for our Ph.D. graduation requirement.

THANK YOU

reply

SCImago Team

Elena Corera 2 years ago

Dear Kabiru, thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you consult the Scopus database directly. Remember that the SJR is a static image of a database (Scopus) which is changing every day. Best regards, SCImago Team

A **Asha Rajiv** 3 years ago

Wanted to know whether the journal is scopus indexed?

reply

SCImago Team

Elena Corera 3 years ago

Dear Asha,

please, check comments below.

Best regards,
SCImago Team

a ridwan 3 years ago

if this conference and proceeding indexed by scopus how could i find my id author in scopus ?

reply

S **Salam Jabr** 2 years ago

https://www.eetc-pec19.org
/?fbclid=IwAR2IOrbhvf6gtCwmddESpBVea7_p9MCW_bw3WUrzzZV1IB5BMgl6d5FA1mA

SCImago Team

Elena Corera 3 years ago

Dear A Ridwan,

thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/

Best Regards,
SCImago Team

T **Thanikasalam** 3 years ago

Hi, is this Scopus indexed?

reply

SCImago Team

Elena Corera 3 years ago

Dear Thanikasalam,
thank you for your request, all the journals included in SJR are indexed in Scopus. Elsevier / Scopus is our data provider.
Best Regards,
SCImago Team

Dr.Ellahi 3 years ago

Dear Mam,
Just i want to ask you it is SCI,SCIE,OR EI or other journal?I know it is conference proceeding journal.
Thanks.

reply

SCImago Team

Elena Corera 3 years ago

Dear Dr Ellahi, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal

Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

N **Nikhil jain** 3 years ago

Madam icame 2018 conference papers not published yet can you tell me status

reply

SCImago Team

Elena Corera 3 years ago

Dear Nikhil,

articles publicated in 2018 are not over yet (we are in September). 2018 indicators will not be available until June 2019. We can not see what will happen in the future with this journal. SCImago receives the data from Scopus / Elsevier annually and does not have the authority to include, exclude or modify the data provided by Scopus.

Best Regards,
SCImago Team

M **Moisés Toapanta** 3 years ago

The IOP Conference is considered a research journal or only remains in conference proceedings. What is the difference of the SJR impact between a conference journal and a scientific journal

reply

SCImago Team

Elena Corera 3 years ago

Dear Moisés,
thank you very much for your comment. This journal is a conference proceedings. We only do an SJR calculation, it is the same for any type of publication
Best Regards,
SCImago Team

V **Vadym** 3 years ago

Dears, colleagues!

The journal IOP Conference Series: Materials Science and Engineering is it Q3 or Q4?

Best Regards

reply

ahmad fauzi 1 year ago

why journal of physics (IOP conferences has Q3? but the journal don't have. Both of them are conferences

SCImago Team

Elena Corera 3 years ago

Dear friend,
It's a conference, it does not have a quartile.
https://www.scimagojr.com/journalsearch.php?q=19700200831&tip=sid&clean=0
Best Regards, SRG

Leave a comment

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The users 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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IOP Conference Series: Materials Science and Engineering

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2018

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Quality in Research: International Symposium on Materials, Metallurgy, and Chemical Engineering 24–27 July 2017, Bali, Indonesia

Accepted papers received: 07 February 2018
Published online: 27 March 2018

Open all abstracts

Preface

OPEN ACCESS 011001
Quality in Research: International Symposium on Materials, Metallurgy, and Chemical Engineering
+ Open abstract View article PDF

OPEN ACCESS 011002
Conference Organizer
+ Open abstract View article PDF

OPEN ACCESS 011003
Acknowledgement
+ Open abstract View article PDF

OPEN ACCESS 011004
Peer review statement
+ Open abstract View article PDF

Papers

Intl. Conf. on Saving Energy in Refrigeration and Air Conditioning (ICSERA)

OPEN ACCESS 012001
Studies of the water adsorption on Lampung's natural zeolite of Indonesia for cooling application
D A Wulandari, Nasruddin and Lemington
+ Open abstract View article PDF

OPEN ACCESS 012002
Characteristics Air Flow in Room Chamber Test Refrigerator Household Energy Consumption with Inlet Flow Variation
Edy Susanto, M. Idrus Alhamid, Nasruddin and Budihardjo
+ Open abstract View article PDF

Intl. Conf.on Dwelling Form (IDWELL) 2017

OPEN ACCESS 012003

The floating houses of Sintang City: space, resources and political nexus

M S Lubis, T Y Harjoko and D Susanto

+ Open abstract View article PDF

Intl. Conf.on Dwelling Form (IDWELL) 2017 Intl. Symp. on Architecture

OPEN ACCESS 012004

The concept of sustainable prefab modular housing made of natural fiber reinforced polymer (NFRP)

E Setyowati and E E Pandelaki

+ Open abstract View article PDF

Intl. Symp. on Architecture

OPEN ACCESS 012005

Thermal Effectiveness of Wall Indoor Fountain in Warm Humid Climate

J A P Seputra

+ Open abstract View article PDF

OPEN ACCESS 012006

The Crux of Minimalist Architecture: A Local Strategy of Housing Design in Jakarta or a Break Free from Traditions?

Yulia Nurliani Lukito and Bella Previta Handoko

+ Open abstract View article PDF

Intl. Symp. on Chemical Eng.

OPEN ACCESS 012007

Degradation Behaviour of Gamma Irradiated Poly(Acrylic Acid)-graft-Chitosan Superabsorbent Hydrogel

Dhena Ria Barleany, Alpin Ilhami, Dea Yusuf Yudanto and Erizal

+ Open abstract View article PDF

OPEN ACCESS 012008

The Use of Multi-Reactor Cascade Plasma Electrolysis for Linear Alkylbenzene Sulfonate Degradation

Nelson Saksono, Ibrahim, Zainah and Trisutanti Budikania

+ Open abstract View article PDF

OPEN ACCESS 012009

Carbon nanotubes shynthesis in fluidized bed reactor equipped with a cyclone

P Setyopratomo, M Sudibandriyo and P P D K Wulan

+ Open abstract View article PDF

OPEN ACCESS 012010

The effect of heating temperature on cytotoxicity and α-mangostin yield: Mangosteen pericarp juice and mangosteen extract

Kamarza Mulia, Fitria Hasanah and Elsa A Krisanti

+ Open abstract View article PDF

OPEN ACCESS 012011
Hydrogen Generation by Koh-Ethanol Plasma Electrolysis Using Double Compartement Reactor
Nelson Saksono, Johannes Sasiang, Chandra Dewi Rosalina and Trisutanti Budikania
+ Open abstract View article PDF

OPEN ACCESS 012012
Effect of Feed Gas Flow Rate on CO_2 Absorption through Super Hydrophobic Hollow Fiber membrane Contactor
Sutrasno Kartohardjono, Kevin Alexander, Annisa Larasati and Ivander Christian Sihombing
+ Open abstract View article PDF

OPEN ACCESS 012013
The effect of hydrochloric acid addition to increase carbon nanotubes dispersibility as drug delivery system by covalent functionalization
P P D K Wulan, S H Ulwani, H Wulandari, W W Purwanto and K Mulia
+ Open abstract View article PDF

OPEN ACCESS 012014
CFD study of mixing miscible liquid with high viscosity difference in a stirred tank
S Madhania, A B Cahyani, T Nurtono, Y Muharam, S Winardi and W W Purwanto
+ Open abstract View article PDF

OPEN ACCESS 012015
CFD Modelling of Adsorption Behaviour in AGN Tank with Polyethylene Terephthalate Plastic Waste Based Activated Carbon
Yuliusman, M K Afdhol, Alristo Sanal and Nasruddin
+ Open abstract View article PDF

OPEN ACCESS 012016
Carbon monoxide and methane adsorption of crude oil refinery using activated carbon from palm shells as biosorbent
Yuliusman, M K Afdhol and Alristo Sanal
+ Open abstract View article PDF

OPEN ACCESS 012017
Synthesis and characterization of methyltrihydroxysilane water repellent
A Z Abidin, M N Harjandi, V Wirawan and S M Suharno
+ Open abstract View article PDF

OPEN ACCESS 012018
Preparation of hollow mesoporous carbon spheres and their performances for electrochemical applications
T Ariyanto, G R Zhang, A Kern and B J M Etzold
+ Open abstract View article PDF

OPEN ACCESS 012019
Reaction product of pyrogallol with methyl linoleate and its antioxidant potential for biodiesel
H Sutanto, L Ainny, Lukman, B H Susanto and M Nasikin
+ Open abstract View article PDF

OPEN ACCESS 012020

Catalytic Pyrolysis of Waste Plastic Mixture

Ferdianta Sembiring, Chandra Wahyu Purnomo and Suryo Purwono

+ Open abstract View article PDF

OPEN ACCESS 012021

Studies of Carbonization Process on the Production of Durian Peel Biobriquettes with Mixed Biomass Coconut and Palm Shells

Ellyta Sari, Pasymi, Umar Khatab, Reni Desmiarti, Rian Ariansyah, Hariadi and Sutra

+ Open abstract View article PDF

OPEN ACCESS 012022

Determination of Extraction Process Conditions of Gambier Catechin (Uncaria Gambier Roxb) from Solok Bio Bio Lima Puluh Kota District – West Sumatera

Elly Desni Rahman, Ellyta Sari, Burmawi, Frizka and Endah

+ Open abstract View article PDF

OPEN ACCESS 012023

Monoglyceride contents in biodiesel from various plants oil and the effect to low temperature properties

L Aisyah, C S Wibowo, S A Bethari, D Ufidian and R Anggarani

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