

Proceeding

The First International Seminar on Science and Technology
(ISSTEC 2009)

*The Challenge of Sciences in a Global
Warming Era: Issues and Opportunities
for a Better Life*

SCIENCES GO GLOBAL



UNIVERSITI KEBANGSAAN MALAYSIA



Held from January 24 - 25, 2009

**at Kahar Muzakkir Auditorium Universitas Islam Indonesia
Jogjakarta, Indonesia**

Welcoming Address by the Organizing Committee

Honorable Rector of Universitas Islam Indonesia
Honorable Vice Chancellor of Universiti Kebangsaan Malaysia
Honorable Vice Chancellor of Universiti Malaysia Terengganu
Distinguished invited speakers, participants, ladies and gentlemen,

Welcome you at the First International Seminar on Science and Technology (ISSTEC 2009) this morning here at the Auditorium Kahar Muzakkir Universitas Islam Indonesia, Jogjakarta, Indonesia. These seminars jointly organized are Faculty of Mathematics and Natural Sciences UII, Faculty of Science and Technology UKM and Faculty of Science and Technology UMT, Terengganu.

The international seminar is attended by more than 1000 participants, come from all over Indonesia, Malaysia, Iraq, Yemen, Japan and Australia. We invited 5 Indonesian invited and keynotes speakers and 3 invited speakers come from Malaysia. There are 300 papers to be presented orally and 47 papers presented by poster covering wide-variety subjects of sciences and technology like mathemati

Honorable Minister of Research and Technology of Indonesia
Honcs, statistics, chemistry, pharmacy, computer sciences, physics, biology and engineering.

We thank for organizing committee, especially for UKM and UMT. Finally, we would also like to thank Rector of Universitas Islam Indonesia, Vice Chancellor of Universiti Kebangsaan Malaysia and Vice Chancellor of Universiti Malaysia Terengganu for his support to this seminar.

We hope you will enjoy a pleasant and valuable seminar at Universitas Islam Indonesia.

Chairman,
Riyanto, Ph.D.

Opening speech from the Rector of Universitas Islam Indonesia

Assalamu 'alaikum Wr.Wb.

The honorable Minister of Research and Technology of Indonesia
The distinguished invited speakers, and
All the participants of the ISSTEC 2009

Firstly, I would like to express my great appreciation to the Faculty of Mathematics and Natural Sciences UII as the organiser of this first International Seminar on Science and Technology (ISSTEC 2009) with the theme “The Challenge of Science in a Global Warming Era: Issues and Opportunities for a Better Life”. I am proud that the first meeting of this interesting event is being organized and held in Yogyakarta.

As the biggest and the oldest private university in Yogyakarta, Universitas Islam Indonesia is committed to the excellence in research and teaching. Recently, we are preparing UII as one of the world class universities.

Knowing that committee has selected outstanding speakers from various prestigious institutions, I believe that all of the participants will enjoy the discussion of issues covered by the topic of this seminar. Scientists have shown that the earth's climate is changing dramatically, and human industrial activities and the burning of fossil fuels are largely to blame. Climate change is a crisis we caused together, therefore, a responsibility we all share together. We are deeply concerned with the issues and opportunities in the internationalisation of sciences for better life, sciences have to go green.

Finally, I would once again like to thank the organiser for organising this event, and to thank all the participants attending this ISSTEC 2009 event as well as delivering their scientific presentations. I do really hope that you can enjoy this seminar and have excellent stay in Yogyakarta.

Wassalamu 'alaikum Wr.Wb.

Yogyakarta, March 24, 2009

Prof. Dr. Edy Suandi Hamid, M.Ec.
Rector of Universitas Islam Indonesia

Opening speech from the Vice Chancellor of Universiti Kebangsaan Malaysia

Assalamualaikum wbt. dan Salam Sejahtera

I would like to congratulate the Faculty of Science & Technology, which has taken the initiative in organizing the joint ISSTEC seminar with Universitas Islam Indonesia (UII), concurrent with FST's 10th Anniversary in 2009. This initiative parallels UKM's aspiration to promote academic research collaboration between UKM academic staffs and colleagues from various institutions at national, regional and international levels.

The seminar theme of “The Challenge of Sciences in a Global Warming Era: Issues and Opportunities for a Better Life” is consistent with a research niche of UKM in response to the problem of climate change. Climate change and its enormous impact on life should alert everybody, particularly scientists. The global warming issue has an across-dimension effect in life and its betterment. Thus, through this seminar, I believe collaboration, knowledge sharing and research experiences in this field will be benefited. I also believed this seminar will open up wider opportunities, while crossing academic, management and student borders.

It is hoped that UKM will start the collaboration work on this very day, and continue on to soon strengthen it with wider participation from academicians of various disciplines. This is due to knowledge approach to overcome recent demands unity and perspective from various disciplines. It is hoped that this seminar will fulfill its objectives, which have been outlined by the joint organizers, UKM & UII.

Sekian.

Prof. Dato' Dr. Sharifah Hapsah Syed Hasan Shahabudin
Vice Chancellor
Universiti Kebangsaan Malaysia

Opening speech from the Vice Chancellor of Universiti Malaysia Terengganu

Firstly, I would like to express my utmost appreciation to the organizers and congratulate them for The First International Seminar on Science and Technology 2009. This seminar is the first activity after the signing of MOU on 7 August 2008. As citizens of today's modern world, we have to contribute to developments and the latest discoveries in knowledge and technology. Therefore we need to prepare ourselves to think and compete globally.

UMT has strived very hard to enhance its Key Performance Indicators (KPI) in order to face the challenges of globalization. Therefore UMT puts a lot of effort to alleviate research grants, increase journal publications, employ lecturers with PhD qualification, increase of international students intake, and also signing more MOUs with other universities. In 2008 alone, UMT had received 41 research grants valued at RM6.9 million as compared to only 37 research grants valued RM4.13 million in 2007. Recently, UMT researchers excelled in their achievements at the British Innovation Show 2008 (BIS). This indicates that UMT is now at par with the other well known universities in Malaysia.

To date, UMT has signed MOUs and MOAs with 18 foreign universities. University of Bergen, James Cook University, Kagoshima University, University of South Brittany France, Penn State University and Prince of Songkhla University just to name a few.

In August 2010, the Department of Mathematics UMT shall hold the 5th International Conference on Mathematics and Statistics with the collaboration of Moslem Mathematicians and Statisticians Society in South East Asia. It would be my great pleasure to invite all of you to come and join the conference. Your active participation is a prerequisite for the success of the upcoming conference.

Last but not least, I would like to thank the organizers for their hard work, the plenary speakers and participants for their valuable contributions.
I wish you all the best and enjoy the seminar!

Thank you.

Prof. Dato' Dr. Sulaiman bin Md Yassin

Vice Chancellor
Universiti Malaysia Terengganu

Committees

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Characterization Ni Nanocatalyst on Si (100) Substrate By Sputtering Growth Methods

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Abstract

Characterization Ni metal nanocatalyst had been analyzed on Si (100) substrate with Sputtering Growth Methods. The sputtering conditions used were 4×10^{-1} torr in pressure; 150°C in temperature; 77.3 sccm in Ar gas flow; and 90,30,20 minutes in time depositions. After growth deposition, metal nanocatalysts were annealed in temperature 600°C for 30 minutes. Characterizations of Ni metal nanocatalysts were used Scanning Electron Microscopy (SEM) and Energy Dispersive Analysis X-Ray (EDAX) and we found the tendency of smallest structure with decrease of time deposition.

Keywords: nanocatalyst, sputtering, anneal.

Introduction

Since Iijima [1] was first discovered carbon nanotubes (CNT) in 1991 with arc discharge methods, it's stimulate a worldwide research effort to improving their synthesis, structure determination and physical properties calculation and identification. Carbon nanotubes (CNTs) are considered as one of the most promising candidates to replace some of today's materials used in microelectronics manufacturing because the advantage of CNT where it can be metallic or semi-conducting depend on diameter and chirality (the angle at which the grapheme layer is rolled up)[2-4]. However to control accurate diameter and chirality of CNT still in research [2], some scientist introduce a metal nanocatalysts to lead the growth of carbon nanotubes. The metal catalyst is needed are transition metal such as Fe, Co, Mo, Ni and Mn [5]. The diameter and thickness (island) of catalyst must in nanometer scales; because the catalyst leads to build the CNT, ones of the metals nanocatalysts that investigate is Nickel [6].

The morphology and size of nanocatalysts are key factor in determining the shape and dimension of carbon nanotubes.[6-7]. So, synthesis of metal nanocatalyst is necessary to investigate and analysis. Scientists introduces some methods, the methods are use laser ablation, mechanical ball milling, combustion flame, microwave plasma discharge and ion sputtering, and sol-gel methods.[xxx] In this experiment we use the ion sputtering methods where the reactor called *dc-Unbalanced Magnetron Sputtering (dc-UBMS)*

reactor This method had advantages from others such as simple method, clean process, and the way to control the shape and size of nanocatalyst [8-9]. Ion sputtering methods are used ion beam to sputter the solid target. To generate ion beam a high voltage was applied between two electrodes that placed in chamber and fill it with Ar gas. The chamber pressure and sputtering voltage both influence the morphology and growth rate of resulting nanocatalyst film. The high chamber pressures made high frequent collisions of sputtered species (Ni pellets) with the chamber gas atom leads to a rapid decrease in temperature of the sputtered atoms, and the nucleation growth above substrate. The sputtering voltage affects the chemical reactions between colliding molecules before they nucleate into substrate.

Experiment

The preparation of substrate must in good concern, before deposition of the nickel film. The substrate that we use is silicon wafer, Si(100). The substrate was cut into pieces measuring 10 mm × 10 mm and then cleaned in acetone and stirred it for 5 minutes after that we put it in DI water and stirred it for 5 minutes, and clean it again with methanol and DI water and stirred it for 5 minutes each, after that we stirred it in HF 20% for 3 minutes and dry it with N₂ gas. The cleaned pieces were mounted on the surface of a stainless steel resistive heater of the sputtering chamber (figure1).



Figure 1. Sputtering Reactor

The nickel pellets put on target of sputtering chamber. The nickel pellet was made from 10 gram nickel powder and grained it for 10 hours. The chamber was pumped down, with the pressure below 3.6×10^{-1} torr before argon gas was introduced into the chamber. After the Ar gas flow we maintained a working pressure of 4.0×10^{-1} torr. The argon gas was flowed in 77.3 sccm. After all parameter stable we generated ion sputtering, with the voltage around 700 Volt. The substrate temperature was kept in 150°C. The deposition time that we used was variable in 90, 30 and 20 minutes. The growth parameters are listed in the table 1. After the nickel deposition, the substrate was annealed in the furnace tube, to grow nickels islands/clusters on the substrate. The annealing temperature was 600 °C, for 30 minutes (sample 1 and 2) and 20 minutes (sample3).

Table 1. The Growth Parameters of Ni-catalysts on Si(100) substrates

Number of samples	I (Ampere)	V (Volt)	t _{deposition} (minute)	t _{annealing} (minute)
Sample 1	0,025	660	90	30
Sample 2	0,026	670	30	30
Sample 3	0,028	700	20	20

Result and Discussion

The characterization of metal nanocatalyst that we used was Scanning Electron Microscopy (SEM) to analyze the effect of time deposition parameters on surface morphology of nanocatalysts. In addition to the measurement of energy dispersive analysis X-ray (EDAX) was done to know the Ni composition. The SEM results can be seen in the figures 2-4. From the figure it can estimate the morphology quality of the sample 1 (Ni/Si 100) with its time deposition 90 minutes is bigger than the sample 2 and 3. Fig.2 shows the Ni catalyst clusters with the size around 50 nm. The clusters of sample 2 of Ni/Si(100) are still rough as well as the sample 3, but the cluster size had tendency to smallest cluster. This rough condition due to their time deposition and annealing time [10], especially sample 3. According to the growth parameter of sample 3, the annealing time was just 20 minutes. It can be explained that the sample needs much time to form clusters.

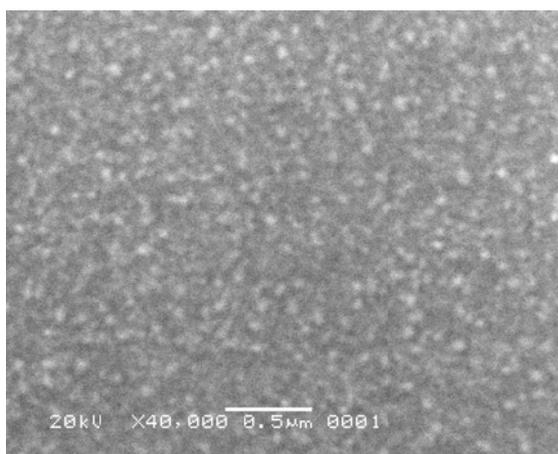


Figure2. SEM surface morphology of Ni /Si (sample1)

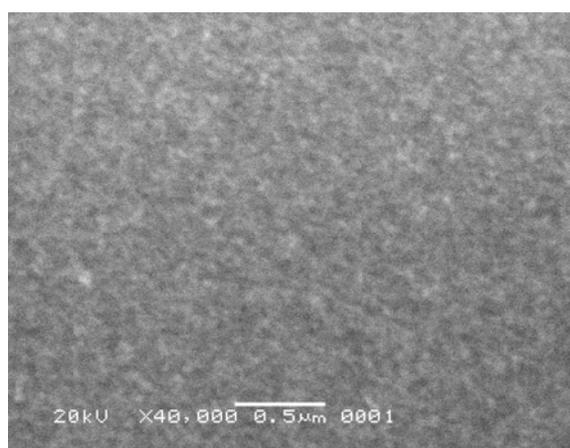


Figure3. SEM surface morphology of Ni /Si (sample2)

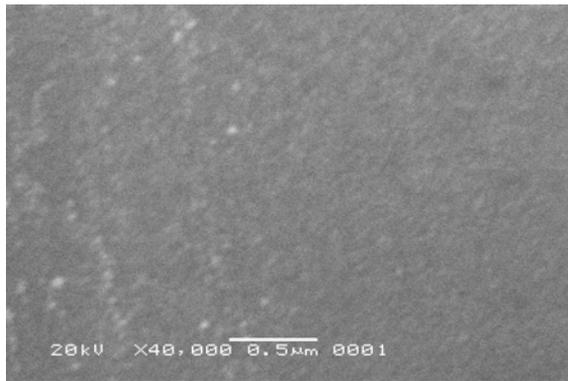


Figure 4. SEM surface morphology of Ni/Si (sample3)

Table.2 and Fig.5 shows that the atomic compositions decrease with the increasing of the time deposition.

Table 3. Atomic composition of Si and Ni

Deposition Time (minute)	Atomic compositions (%)	
	Si	Ni
20	97.50	2.50
30	97.52	2.48
90	98.81	1.19

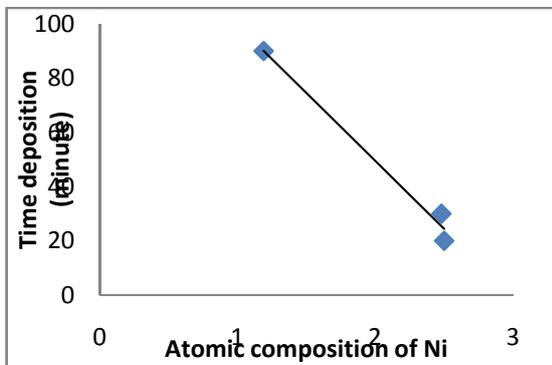


Figure 5. Relation of deposition time and Atomic composition of Ni

Conclusion

The growth of Nickel nanocatalyst on Si (100) substrate with deposition time 90, 30 and 20 minutes have been deposited. Its diameter size is

around 50 nm, and had tendency to smallest cluster for time deposition in 20 minutes. The annealing time affects both the surface morphology and diameter size of catalysts. It needs advanced experiment to increase the quality of nanocatalysts.

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