Document details

Journal of Physics: Conference Series
Volume 1295, Issue 1, 8 November 2019, Article number 012074
3rd International Conference on Chemical and Material Engineering, ICCME 2018; Department of Chemical Engineering, Faculty of Engineering, Diponegoro UniversitySemarang; Indonesia; 19 September 2018 through 20 September 2018; Code 155151

A Comparative Study on FeCrAl Alloy and NiCrSi Alloy Materials as Heating Element at Low Energy Oven (Conference Paper) (Open Access)

Syakur, A.[a], Vingtsabta, V.[a], Swastawati, F.[b], Wijayanti, I.[b]

[a]Department of Electrical Engineering, Faculty of Engineering, Diponegoro University, Semarang, Indonesia
[b]Department of Fisheries Processing Technology, Faculty of Fisheries and Marine Science, Diponegoro University, Semarang, Indonesia

Abstract

View references (6)

In this era we need lower energy consumption in electronic devices, example on oven . There is a heating element inside the oven . The heating element should produce high temperature with low energy consumption. Heating element in this research use FeCrAl alloy and NiCrSi alloy . FeCrAl alloy or Kanthal A -1 wire consists of 20% chromium, aluminum and ferum. NiCrSi or Nichrome 80 consist of 80% nickel, 19,5% chromium and 1,45 silicon. The reason using these both wire, because both of wire have high resistivity and produce high temperature. In this research using FeCrAl alloy and NiCrSi alloy 0,8 mm with variations in coil diameter 10 mm. Both of wire applied in oven 40 cm x 40 cm x 50 cm to produce 40 °C . From FeCrAl alloy dan NiCrSi alloy to produce 40 °C with same voltage input, NiCrSi 0,8 mm with 10 mm diameter produced power 170 Watt took 4.4 minutes to reach 40 °C and the energy consumption is 12,5 Wh. With same diameter FeCrAl produced power 210 W took 4,4 minutes to reach 40 °C and energy consumption is 15,4 Wh. From the data results show that the NiCrSi alloy has lower resistance value than the FeCrAl Alloy . It can be concluded that NiCrSi alloy diameter of 0.8 mm with a winding diameter of 10 mm consumes low energy in generating heat. © 2019 Published under licence by IOP Publishing Ltd.

SciVal Topic Prominence

Topic: Thermal barrier coatings | Superalloys | Grown oxide

Prominence percentile: 97.604

Chemistry database information

Substances

Al

Source details

Journal of Physics: Conference Series

Scopus coverage years: from 2005 to Present
Publisher: Institute of Physics Publishing
ISSN: 1742-6588 E-ISSN: 1742-6596
Subject area: Physics and Astronomy: General Physics and Astronomy

View all documents > Set document alert Save to source list Journal Homepage

CiteScore 2018
0.51

SJR 2018
0.221

SNIP 2018
0.454

CiteScore | CiteScore rank & trend | CiteScore presets | Scopus content coverage

CiteScore 2018 Calculated using data from 30 April, 2019

$$0.51 = \frac{\text{Citation Count 2018}}{\text{Documents 2015 - 2017*}} = \frac{\text{11,243 Citations}}{\text{21,896 Documents}}$$

*CiteScore includes all available document types View CiteScore methodology > CiteScore FAQ >

CiteScoreTracker 2019 Last updated on *09 April, 2020*
Updated monthly

$$0.59 = \frac{\text{Citation Count 2019}}{\text{Documents 2016 - 2018}} = \frac{\text{18,254 Citations to date}}{\text{31,135 Documents to date}}$$

Metrics displaying this icon are compiled according to Snowball Metrics ↗ , a collaboration between industry and academia.

CiteScore rank

Category	Rank	Percentile
Physics and Astronomy — General Physics and Astronomy	#167/216	21st

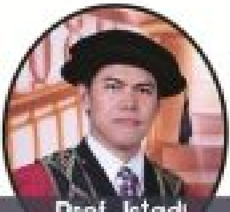
View CiteScore trends >
Add CiteScore to your site

3rd

ICCME 2018

International Conference on Chemical and Material Engineering

Keynote Speakers



Prof. Istadi
UNDIP, Indonesia

Prof. Hong-Wei Yen
Tunghai Univ., Taiwan

Prof. A. L. Ahmad
USM, Malaysia

Prof. Li Xiaodong*
Zhejang Univ., China

*in confirmation

Conference Topics

- Heat and mass transfer
- Chemical reaction engineering and catalysis
- Thermodynamics
- Separation and purification
- Bioprocess engineering
- Process design and control
- Clean production including waste disposal
- Energy conversion and development
- Sustainable Development and Higher Education in Chemical Engineering
- Micro and nano materials
- Smart/Intelligent & Functional materials
- Polymer synthesis and modification
- Surface engineering and coating
- Material forming
- Modeling, Analysis and Simulation of Manufacturing Processes

Publication

Selected papers presented on ICCME 2018 will be published in,

- **IOP Proceeding Conference (SCOPUS indexed)**
- **Bulletin of Chemical Reaction Engineering & Catalysis (SCOPUS indexed)**
- **Journal of Physical Science (SCOPUS indexed)**

Submission & Registration

Authors are invited to submit their papers at the ICCME 2018 website: **iccme2018.undip.ac.id**
Detailed instructions are shown at the CALL FOR PAPER AND REGISTRATION page.

Important Dates

2nd ANNOUNCEMENT

Abstract submission	**10th August 2018**
Acceptance notification	13th August 2018
Paper submission deadline	25th August 2018
Final Registration	3rd September 2018
List of oral presentations	10th September 2018
Conference Days	**19th September 2018**

Registration Fee

International participants	350	USD
International students	250	USD
Indonesian participants	3,000,000	IDR
Indonesian students	2,000,000	IDR
Audience - participants*	2,000,000	IDR
Audience - students*	1,500,000	IDR

*No Publication

Payment : Bank Transfer to BANK MANDIRI, account no. 136-00-1595950-2, swift codes: BMRIIDJA854 (Fitria Mayasari) KCP Semarang Diponegoro University

Location

Grand Candi Hotel, Semarang
Jalan Sisingamangaraja No.16, Kaliwiru, Candisari, Kota Semarang, Jawa Tengah 50232

Contact Person

Departement of Chemical Engineering, Diponegoro University
Jl. Prof. Soedarto, SH, Semarang, Indonesia 50275
Tel/Fax: (+62) 24-7460058/(+62) 24-76480675
Email : iccme2018@che.undip.ac.id
Web : http://iccme2018.undip.ac.id/

ORGANIZED BY:

The 3rd ICCME 2018

International Conference on Chemical and Material Enginering

Welcome to ICCME 2018

Paper DEADLINE EXTENDED

REGISTRATION

Speakers

The Program of ICCME 2018 will include a plenary lecture and parallel session given by the following speakers:

Keynote Speaker

see more

see more

see more

SEARCH

Search ...

FIND US

Department of Chemical Engineering

Diponegoro University

Jl. Prof. Soedarto, SH, Semarang, Indonesia, 50275

Phone/Fax : (+62) 24-7460058/(+62) 24-76480675

Email : iccme2018@che.undip.ac.id

ANNOUNCEMENT

Full paper submission deadline EXTENSION

The announcement of the Accepted paper

Conference program

see more

Abstract Book

Invited Speaker

see more

see more

Conference Day

0 0 0 : 0 0 0 : 0 0 : 0 0 : 0 0

Years Days Hours Minutes Seconds

IOP Conf. Series: Journal of Physics: Conf. Series **1295** (2019) 011001 doi:10.1088/1742-6596/1295/1/011001

Preface

International Conference on Chemical and Material Engineering (ICCME) 2018

The 3rd International Conference on Chemical and Material Engineering (ICCME) 2018 was held by the Department of Chemical Engineering - Universitas Diponegoro in conjunction with the 60th anniversary of Faculty of Engineering - Universitas Diponegoro. The event was conducted on September 19th 2018 in Grand Candi Hotel Semarang - Indonesia. This event was the continuation of the preceding conferences held in 2013 and 2015. The ICCME 2018 brought "Chemical and Material Engineering for Sustainable Foods, Energy, and Environment" as the grand theme. The objectives of this conference are:

- To disseminate and develop the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions in the fields of chemical and material engineering.
- To encourage international collaborations and joint ventures
- To promote and facilitate the growth of scientific and technical development in the field of chemical and material engineering development in Indonesia and the Asia region

Although the organizing committee received a total of 115 abstract papers, the scientific committee decided that only 97 papers were eligible for oral presentations which came from Indonesia, Malaysia, Myanmar, the Philippines, Taiwan, Japan and Austria. In addition, 3 keynote and 3 invited speakers from abroad were presented during this conference. This special issue proceeding presents 76 papers selected from the presented papers after being thoroughly peer reviewed.

Special thanks are due to all keynote and invited speakers for their participation, to the Organizing Committee members for all their hard work in making the conference to happen, especially Universitas Diponegoro Chemical Engineering Master Program students who generously supported the conference. The Scientific Committee members are also thanked for reviewing the submitted manuscripts and for assisting in the editorial process. Finally, all who travelled to Semarang, Indonesia for the meeting are acknowledged for deciding to attend and contribute to making this a successful conference.

IOP Conf. Series: Journal of Physics: Conf. Series **1295** (2019) 011001 doi:10.1088/1742-6596/1295/1/011001

We greatly hope that this proceeding will be advantageous in future implementations of chemical and material engineering, not only to the academia, but also to the industries by which broadening our scientific perspective.

Andri Cahyo Kumoro & Dyah Hesti Wardhani

Conference Scientific and Organizing Committee Chairs

Conference Scientific Committee:

1. Prof. Dr. Andri Cahyo Kumoro, ST, MT (Chair-Indonesia)
2. Prof. Dr. Hadiyanto, ST, MSc (Indonesia)
3. Prof. Hong-Wei Yen (Taiwan)
4. Prof. Abdul Latif Ahmad (Malaysia)
5. Dr. Oki Muraza (Kingdom of Saudi Arabia)
6. Dr. Xosè Antòn Vàzquez Àlvarez (Spain)
7. Dr. Ivan Salmeron Ochoa (Mexico)

Table of contents

Volume 1295

2019

Previous issue Next issue

The 3rd International Conference of Chemical and Materials Engineering 19–20 September 2018, Semarang, Indonesia

Accepted papers received: 09 July 2019
Published online: 08 November 2019

View all abstracts

Preface

Papers

Heat and Mass Transfer

Chemical Reaction Engineering and Catalysis

Separation and Purification

Sustainable Development and Higher Education In Chemical Engineering

Micro & Nanomaterials

Smart/Intelligent & Functional Materials

JOURNAL LINKS

Journal home

Information for organizers

Information for authors

Search for published proceedings

Contact us

Reprint services from Curran Associates

IOP Conf. Series: Journal of Physics: Conf. Series **1295** (2019) 012074 doi:10.1088/1742-6596/1295/1/012074

A Comparative Study on FeCrAl Alloy and NiCrSi Alloy Materials as Heating Element at Low Energy Oven

Abdul Syakur*[1], Veinard Vingtsabta[2], Fronthea Swastawati[3], Ima Wijayanti[4]

[1,2] Department of Electrical Engineering, Faculty of Engineering, Diponegoro University, Semarang, Indonesia.
[3,4] Department of Fisheries Processing Technology, Faculty of Fisheries and Marine Science, Diponegoro University, Semarang, Indonesia.
*Email: syakur@elektro.undip.ac.id[1]

Abstract. In this era we need lower energy consumption in electronic devices, example on oven. There is a heating element inside the oven. The heating element should produce high temperature with low energy consumption. Heating element in this research use FeCrAl alloy and NiCrSi alloy. FeCrAl alloy or Kanthal A-1 wire consists of 20% chromium, aluminum and ferum. NiCrSi or Nichrome 80 consist of 80% nickel, 19,5% chromium and 1,45 silicon. The reason using these both wire, because both of wire have high resistivity and produce high temperature. In this research using FeCrAl alloy and NiCrSi alloy 0,8 mm with variations in coil diameter 10 mm. Both of wire applied in oven 40 cm x 40 cm x 50 cm to produce 40 ^oC . From FeCrAl alloy dan NiCrSi alloy to produce 40 ^oC with same voltage input, NiCrSi 0,8 mm with 10 mm diameter produced power 170 Watt took 4.4 minutes to reach 40 ^oC and the energy consumption is 12,5 Wh. With same diameter FeCrAl produced power 210 W took 4,4 minutes to reach 40 ^oC and energy consumption is 15,4 Wh. From the data results show that the NiCrSi alloy has lower resistance value than the FeCrAl Alloy. It can be concluded that NiCrSi alloy diameter of 0.8 mm with a winding diameter of 10 mm consumes low energy in generating heat
Keywords: FeCrAl Alloy, NiCrSi Alloy, resistivity, heating element, energy consumption

1. Introduction

The need for human life at this time is increasingly complex, so that to help everyday life is needed practical, low cost and safe technology. This technological advancement is certainly not only aimed at the technology itself but more importantly for human welfare. One of the uses is in the industrial sector. In one industry, the process of drying fish. Then we need an oven that is safe, economical and environmentally friendly. In oven is used a heater to dry the fish, the heater has various type [1].

Oven is a device used to dry a wet material into dry material so that it can be stored for a long time. The drying process with the oven uses a medium that can hold the heat temperature constantly. The oven generally uses a heater [2][3].

As a source of heat generated by electric heating elements sourced from high-resistance wire or tape (resistance wire) usually the material used is Niklin wire which is rolled like a spiral shape and inserted in pipe as a insulator, then injected by electric current at both ends and coated with an electrical insulator that is able to continue heat well until it is safe to use . The shape and type of the electrical heating element varies according to the function of the installation place [4].

IOP Conf. Series: Journal of Physics: Conf. Series **1295** (2019) 012057 doi:10.1088/1742-6596/1295/1/012057

Gas permeation properties and preparation of carbon membrane by PECVD method using indene as precursor

M Kyaw[1,3,4], N P. Dugos[1], S Mori [2], S A. Roces[1] and A B. Beltran[1], S Suzuki[2]

[1] Chemical Engineering Department, De La Salle University, 2401 Taft Ave, Manila 0922, Philippines

[2] Department of Chemical Engineering, Tokyo Institute of Technology, Tokyo 152-8552, Japan

[3] Department of Chemical Engineering, Mandalay Technological University, Mandalay, Myanmar

E-mail: myatkyaaw@gmail.com

Abstract. This work could demonstrate a new approach to the fabrication of gas separation membrane using indene as polymeric precursor for low pressure PECVD system. Membrane characterization was done by taking Scanning Electron Microscopy (SEM) and FTIR measurements. For membrane performance testing, permeability and selectivity of the membrane were evaluated with pure gases of H_2, N_2, and CO_2 using a differential permeation technique. PECVD-derived polyindene membrane showed selectivities of 8.2 and 4.0 for H_2/CO_2 and H_2/N_2, respectively, at room temperature. Polyindene (PIn) membrane was successfully fabricated onto a zeolite 5A substrate via radio frequency plasma-enhanced chemical vapor deposition (RF-PECVD) at room temperature.

1. Introduction

Membranes in gas separation has been applied because of its advantages such as low energy requirement and low operating cost. In this perspective, the interest on inorganic membranes such carbon membrane for gas separation has also grown for showing higher selectivity and remarkable high thermal and chemical resistances [1]. Generally, a carbon membrane is fabricated by the pyrolysis of an organic precursor and this membrane shows very good molecular sieving effect in gas separation [2]. Normally, membrane fabrication via pyrolysis technique can be done at processing temperature of 500°C and above [1]. For instance, Teixeira et al. fabricated supported carbon membrane using phenolic resin solution by pyrolysis technique with heating up to 900°C under nitrogen atmosphere. In their research work, the resultant membrane showed significant performance in terms of gas separation and selectivity [3]. In this method, it needs high temperature to decompose the polymeric precursor in membrane fabrication process.

IOP Conf. Series: Journal of Physics: Conf. Series **1295** (2019) 012053 doi:10.1088/1742-6596/1295/1/012053

Morphological and Optical Properties of Polylactic Acid Bionanocomposite Film Reinforced with Oil Palm Empty Fruit Bunch Nanocrystalline Cellulose

E Indarti[1*], Marwan[2] and W D. Wan Rosli[3]

[1]Department of Agricultural Product Technology, Faculty of Agriculture, Syiah Kuala University, Darussalam, Banda Aceh 23111, Indonesia
[2]Department of Chemical Engineering, Faculty of Engineering, Syiah Kuala University, Darussalam, Banda Aceh 23111, Indonesia
[3]Bioresource, Paper and Coating Division, School of Industrial Technology, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia

*Email: eti_indarti@unsyiah.ac.id

Abstract. Nanocrystalline cellulose (NCC) was derived from oil palm empty fruit bunch (OPEFB) by soda pulping and followed by 2,2,6,6-tetramethylpiperidine-1-oxy (TEMPO) oxidation reaction method. The NCC was used as reinforcing agent in Polylactic acid (PLA) biopolymer film matrix with 0 to 20% loadings. Bionanocomposite film was prepared by dilution in Chloroform and casted on the flat glass with 0.03-0.05 mm casting thickness. TEM shows that the nanocrystalline cellulose (NCC) has a rod like shape of 2-6 nm width and 200-500 nm length. SEM micrograph shows that the surface of PLA-NCC bionanocomposites has a relative good dispersion at low NCC loading (1, 3 and 5 wt.%), and a rougher surface at higher NCC loadings. The PLA bionanocomposites film as obviously seen exhibits decrease in transparency as the NCC content increased. The transparency of neat PLA film has higher transmission value compare to other PLA-NCC and tend to reduce the transmission percentage as the NCC loading increase, especially for 10 and 20%.

1. Introduction

The use of biopolymer is growing as more concerns on environmental impacts of petroleum based plastics. One of the most valuable biopolymer is polylactic acid (PLA) due to some advantage properties, for instances renewability, biodegradability, compatibility and excellent in transparency. However PLA has shortcoming such as low thermal resistance, brittles, and poor gas and water vapor permeability [1]. To extend its applications, improvement of its properties is required. One of the most promising material to enhance the properties of the PLA is cellulose asmany researches have shown recently [2-5].

In general, preparation of biodegradable plastics requires fillers as reinforcing phase made of bioresources. Many studies have shown that various forms of nano-size cellulose have been incorporated into PLA matrix have contributed to improved mechanical and barrier properties of the biocomposites [6, 7]. Growing interest in nanocomposites has been related to several reasons, among them are possible to design and create new materials and structures with exceptional flexibility and physical properties,