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Indonesian Chemical Engineering Education Association (Aptekim) Department of Chemical Engineering Universitas Diponegoro Department of Chemical Engineering UPN Veteran Yogyakarta

Norman Iskandar

has succesfully accomplished his / her role as

Presenter

In The 2nd International Symposium of Indonesian Chemical Engineering (ISIChem)

Semarang, 6 - 7 October 2021



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Conference Proceedings ISSN 0094243X ISBN 978-073544336-5 DOI 10.1063/5.0112560 View more ✓

The effect of binder concentration on characteristic of pellet catalyst

Iskandar, Norman^a 🖾 ; <mark>Sulardjaka, Sulardjaka</mark>^a 🖾 ; Syaiful, Syaiful^a 🖾 ; Widayat, Widayat^b 🖾 🗟 Save all to author list

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^b Department of Chemical Engineering Department, Faculty of Engineering, University of Diponegoro, Jl. Prof. Sudharto SH, Tembalang, Semarang, 50275, Indonesia

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Abstract

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Abstract

The CaO.SiO2 gel preparation process was carried out based on the Sol-Gel method by mixing CaO Sol with SiO2 sol in a ratio of 1: 5. Starch-based binders with variations in the amount of 1%, 2%, 3%, 4%, and 5% were added. The dry gel has resulted. The dry gel ground, sieved, and sintered at a temperature of 1000oC for 3 hours, then molded into a catalyst tablet with a hydraulic press. The 9 mm in diameter mold used and has a compression pressure of 90 kg/cm2 with an average weight of 5 grams per catalyst sample. Catalyst pellets were characterized. The density test, PSA, SEM, XRD, XRF, and mechanical strength test using ASTM D4179 standard method were carried out to characterize the pellets. The results of the density analysis test given the data that the variations of the binders from 1 to 5% do not correlate directly with changes in the pellet density. The results of the XRF and XRD test obtained data that the main elements present in the catalyst are K, Ca, Si, and the dominant metal oxides are formed, namely K2O, CaO, SiO2, which in order of mass percentage are the same, but with different mass values. Crystal sizes in the catalyst strength decreases in line with the addition of the binder, where the catalyst with a binder should have been mechanically strengt decreases in line with the addition of the binder. This is due to the large compaction pressure in the catalyst formation process which is below the standard so that can not provide sufficient pressure for forming the catalyst pellets, which are needed to form bonds between the constituent particles in the pellets. © 2023 Author(s).

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The aims of the 2nd ISIChem 2021 are to be an international platform for the students, academia, researchers, industries, and governments in discussing their research results, communicating the ideas, and sharing about all matters related to chemical engineering. The 2nd ISIChem 2021 also provides an opportunity to establish international networks among participants thus enhancing the research quality.

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- Heat, Mass and Momentum Transfer
- Chemical Reaction Engineering and Catalysis
- Thermodynamics
- Separation and Purification Technology
- Bioprocess and Biochemical Engineering
- Clean Production and Waste Management
- Energy Conversion and Management
- Sustainable Development and Higher Education in Chemical Engineering
- Advanced and Smart Material Development
- Food Science and Technology
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Professional	2,500,000 IDR	200 USD
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AIP Conference Proceedings, Scopus indexed journal

IJRED (International Journal of Renewable Energy Development), a Scopus indexed journal

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2nd ISIChem 2021

October 6-7, 2021 (online)





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Important Date

Full paper submission deadline	: August 1 , August 31 2021
Accepted full paper notification	: September 17, 2021
Registration fee payment deadline	: October 1, 2021
Conference date (online)	: October 6-7, 2021

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PRELIMINARY



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Nancy Siti Djenar; Joko Suryadi; Geraldy Andreas Sitepu; Army Adi Sutanningsih

AIP Conference Proceedings 2667, 020001 (2023) doi: https://doi.org/10.1063/5.0112340



Drying of tomato slices using solar drying method

Suherman Suherman; Riri Marza Rilna; Naufal Afriandi; Evan Eduard Susanto; Hadiyanto Hadiyanto

AIP Conference Proceedings 2667, 020002 (2023) doi: https://doi.org/10.1063/5.0112428

 The effect of solvents and extraction time on anthocyanin extraction from butterfly pea (<i>Clitoria ternatea</i> L.) Amin Abdillah Harahap; Kelvin Letare S.; Nuniek Hendrianie <i>AIP Conference Proceedings</i> 2667, 020003 (2023) doi: https://doi.org/10.1063/5.011277 Abstract V View article PDF Comparison of sequential microwave/ultrasound and microwave extraction of total phenolic compounds from <i>Moringa oleifera</i> L. Aji Prasetyaningrum; Bakti Jos; Kristinah Haryani; Gian Restu Prinanda <i>AIP Conference Proceedings</i> 2667, 020004 (2023) doi: https://doi.org/10.1063/5.013008 	Abstract ∽	View article	D PDF	
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Microwave-assisted pretreatment and span 80 addition to improve the enzymatic hydrolysis of chitosan

Nur Rokhati; Heru Susanto; Nur 'Aini Hamada; Aprilia Khadijah Putri; Martin Raynaldi Simanjuntak; Widyah Anggraini

AIP Conference Proceedings 2667, 020006 (2023) doi: https://doi.org/10.1063/5.0129783



Moisture removal observation of onion slice drying at various temperature

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Effect of plastic waste pollution in seawater to microplastic contamination in salt fields at Rembang

Nilawati Nilawati; Sunarsih Sunarsih; Sudarno Sudarno

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Optimization of black cumin oil separation process with food grade qualification using hydrodistillation method through pre-extraction treatment variation

Achmad Ferdiansyah Pradana Putra; Elisabeth Ratnani Wahyu Hapsari; Achmad Haris Sofani

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Stability of fish oil emulsion using modified alginate as emulsifier

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Optimization hydrogen peroxide oxidation of cassava starch to improve psychochemical properties with surface response method

Siswo Sumardiono; Fitri A. Idris; Eko Tribowo; Heri Cahyono AIP Conference Proceedings 2667, 020011 (2023) doi: https://doi.org/10.1063/5.0115168

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Modification of cassava starch by hydrolysis and peroxide oxidation to improve physicochemical properties and application for coated peanut production

Noer Abyor Handayani; Albert Iskandar Koeswoyo; Sherly Zagita Listyani Nurhatta; Siswo Sumardiono

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Heavy metals contamination in sea cucumber (*Phylloporus spiculatus*) at Kenjeran, Surabaya, Indonesia: Cracker product of small-medium sized enterprise

Ririn Sumiyani; Nurmalina Muliani; Catharina Ratna; Orchidea Rachmaniah *AIP Conference Proceedings* 2667, 020014 (2023) doi: https://doi.org/10.1063/5.0112417



The effect of ozonation on the physicochemical, thermal, and morphological properties of starch: An overview

Heri Cahyono; Bakti Jos; Siswo Sumardiono

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The input voltage and reaction time from dielectric barrier discharge treatment affect the biogas production and the reduction of pollutants in palm oil mill effluent

Reni Desmiarti; Nola Tri Utami; Muhammad Adios; Ofta Bima Sakti; Dharma Raka Saputra; Adinda Ratu Permata; Ariadi Hazmi; Maulana Yusup Rosadi

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Various active materials implications on the performance of all organic redox flow battery (AORFB) in aqueous electrolyte

Dessy Ariyanti; Aprilina Purbasari

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Types and variations of buffer concentrations effect on biohydrogen productivity from sago dregs with fermentation method

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Bioethanol production from rice straw waste by enzyme catalyst using separated hydrolysis and fermentation (SHF) method

Indra Gunawan; Indro Sumantri

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Production of electricity from food waste using microbial fuel cell and hydrolytic microorganisms

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SEPARATION AND PURIFICATION TECHNOLOGY

Fouling reduction evaluation of PVA coated sZnO-PSf composite membrane in natural rubber wastewater treatment

Tutuk Djoko Kusworo; Budiyono Budiyono; Kristinah Haryani; Dani Puji Utomo; Yeni Maryani Candra; Nur Asiyah

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Novel sulfonated zinc oxide embedded polysulfone (PSfsZnO) membrane for rubber wastewater treatment

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AIP Conference Proceedings 2667, 040002 (2023) doi: https://doi.org/10.1063/5.0112321



Ultrasound assisted extraction of microalgae Spirulina sp.

Alinda Fitrotun Nisya; Rochmadi Rochmadi; Arief Budiman

AIP Conference Proceedings 2667, 040003 (2023) doi: https://doi.org/10.1063/5.0112300



Extraction of caffeine from dark Chinese tea using ethyl lactate solvent and its encapsulation with alginate and chitosan

Aprilina Purbasari; Edoardo Gilang Savio; Jabbar Akbar

AIP Conference Proceedings 2667, 040004 (2023) doi: https://doi.org/10.1063/5.0112284



Production of fuelgrade bioethanol as a renewable alternative fuel by utilizing rice husk waste as a nano adsorbent with ultrasonic milling process

Abdullah Farhan Taqiyya; Nanda Putri Rahmawati; Ilham Avicenna Iksanto; Tutuk Djoko Kusworo

AIP Conference Proceedings 2667, 040005 (2023) doi: https://doi.org/10.1063/5.0113771

The extraction of kaffir lime *(Citrus hystrix DC.)* peel and leaf essential oil by using water distillation and steam distillation methods

Maulidah Haniati; Alifah Nur Aini Fajrin; Putri Amalia Devianda; Annas Wiguno; Rizky Tetrisyanda; Kuswandi Kuswandi

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Comparison of pretreatment process of sodium hydroxide and soaking in aqueous ammonia for delignification of rice husk

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Model of fouling mechanism in ultrafiltration and micellarenhanced ultrafiltration membrane for reactive dye removal

Nita Aryanti; Vania Frimasgita Giraldi; Heru Susanto; Tutuk Djoko Kusworo; I. Nyoman Widiasa; Nur Rokhati

AIP Conference Proceedings 2667, 040008 (2023) doi: https://doi.org/10.1063/5.0118033



Preparation of CNT used surfactant for activity $CNT-TiO_2$ composites

Desi Heltina; Nadhia Gasani Putri; Utari Avisa; Arif Partama; Komalasari Komalasari

AIP Conference Proceedings 2667, 040009 (2023) doi: https://doi.org/10.1063/5.0113672



Extraction of kaffir lime essential oil (*Citrus hystrix DC.*) with ethanol/n-hexane solvents

Anik Andayani; Maudina Alfira Adzany; Putri Amalia Devianda; Annas Wiguno; Kuswandi Kuswandi

AIP Conference Proceedings 2667, 040010 (2023) doi: https://doi.org/10.1063/5.0112749

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Preparation and performance of interlayer-free organosilica membranes on zirconia support

Noor Aisya Maulida; Siti Humaeroh Fitriah; Aliah Aliah; Erdina Lulu Atika Rampun; Muthia Elma

AIP Conference Proceedings 2667, 040011 (2023) doi: https://doi.org/10.1063/5.0112161



Rubber wastewater treatment using integrated process ozonation-PSf-sZnO membrane filtration

Tutuk Djoko Kusworo; Dani Puji Utomo; Yeni Maryani Candra; Nur Asiyah; Muhammad Itsar Hanif

AIP Conference Proceedings 2667, 040012 (2023) doi: https://doi.org/10.1063/5.0112320



Cellulose acetate – Based mixed matrix membrane for methylene blue wastewater treatment

Putu Doddy Sutrisna; Ronaldo Pangestu Hadi; Candra Wijaya; Jessy Liliani; Christoper Robby

AIP Conference Proceedings 2667, 040013 (2023) doi: https://doi.org/10.1063/5.0112184



Production of nano filter mask as a Covid-19 prevention effort by using an integrated nanofiltration membrane nanosilver-TiO₂-chitosan

Vinalia Agustiani; Aufa Rasendriya; Lailatul Khoiriyah; Tutuk Djoko Kusworo *AIP Conference Proceedings* 2667, 040014 (2023) doi: https://doi.org/10.1063/5.0112270



Purification technology of fermented bioethanol using reflux system distillation

Hargono Hargono; Noer Abyor Handayani; Siswo Sumardiono; Muhammad Fahmi Zakaria

AIP Conference Proceedings 2667, 040015 (2023) doi: https://doi.org/10.1063/5.0114502



The effect of solid waste clay bath pre-treatment on characteristic of CaCO₃ product

Rezi Miravion; Hadiyanto Hadiyanto; Luqman Buchori; Widayat Widayat AIP Conference Proceedings 2667, 040016 (2023) doi: https://doi.org/10.1063/5.0114231



ADVANCED AND SMART MATERIAL DEVELOPMENT

Study of doping Sn atom in silicene nanoribbons in the presence of an external electric field

Hoang Van Ngoc

AIP Conference Proceedings 2667, 050001 (2023) doi: https://doi.org/10.1063/5.0112575

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Aprilina Purbasari Priyanto; Evi Fitri	; Purwanto Purwa ani	anto; Bambai	ng Pramudono; Slamet
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Pristine and modified graphene oxide utilization for organic pollutants removal

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The influence of calcium chloride and potassium chloride cross-linking agent on the physical properties of chitosancarrageenan composite film

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Mechanical properties of natural filling materials for eggshell, rice husk and kenaf in the production of natural rubber latex foam (NRLF) : Review

Ayuni Yustira; Maulida Lubis; Hafifuddin Arif; Andre Pranata

AIP Conference Proceedings 2667, 050005 (2023) doi: https://doi.org/10.1063/5.0113145



Enhance the surface functionality of sugarcane bagasse and rice husk-based magnetic nanoparticle biocomposites by amine group

I. F. Nata; C. Irawan; M. D. Putra; H. Wijayanti; Y. S. Dewi; Y. Meliana AIP Conference Proceedings 2667, 050006 (2023) doi: https://doi.org/10.1063/5.0112267

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Performance of antimicrobial ZnO nanoparticle synthesized by biological method: Literature review

Vita Wonoputri; Jason Wijaya; Vincent Augusta Primayudha; Shafira Khairunnisa; Tjokorde Walmiki Samadhi

AIP Conference Proceedings 2667, 050007 (2023) doi: https://doi.org/10.1063/5.0118678



Decreased levels of FFA (free fatty acid) kemiri Sunan oil with adsorption process using modified Yogyakarta natural zeolite

Didi Dwi Anggoro; Luqman Buchori; Lutfi Hargita Septiawan; Salma Talitha Sani

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Study of adsorption capacity on textile dyes and heavy metal (Pb²⁺) using modified natural zeolite

Didi Dwi Anggoro; Bagas Nur Prayoga; Nabiilah Salsabiil; Luqman Buchori *AIP Conference Proceedings* 2667, 050009 (2023) doi: https://doi.org/10.1063/5.0112356

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Effects of the mole ratio of reactant on the methanolysis of epoxidized tung oil

Eni Budiyati; Rochmadi Rochmadi; Arief Budiman; Budhijanto Budhijanto



CLEAN PRODUCTION AND WASTE MANAGEMENT

Synergistic adsorption and photocatalytic process for COD removal from petroleum refinery wastewater using AC/TiO₂/CeO₂ composite

Tutuk Djoko Kusworo; Febio Dalanta; Nita Aryanti

AIP Conference Proceedings 2667, 060001 (2023) doi: https://doi.org/10.1063/5.0112319



Specific electrical conductivity of K_2SO_4 electrolyte solution for nitrate production by air plasma electrolysis

Harianingsih Harianingsih; Muhammad Fadhilah Ansyari; Eva Fathul Karamah; Nelson Saksono

AIP Conference Proceedings 2667, 060002 (2023) doi: https://doi.org/10.1063/5.0112632



Optimization for cellulose delignification process of Blora teak wood sawdust as wall paint filler material

Muhammad Thariq Thirafi; Rifky Daffa Ramadhan; Yoga Anugra Guslamari; Muhammad Naufal Arkan; Noer Abyor Handayani

AIP Conference Proceedings 2667, 060003 (2023) doi: https://doi.org/10.1063/5.0115553



The evaluation of heavy metal content in the crayons produced by recycling the plastic waste

Lailatul Qomariyah; Novelia Gita Romadhona; Rizka Widya Berliana; Khairun Nisa; Renata Zahabiya

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Predicting and mitigating inorganic scale in XY field

A. A. Pramana; D. Alvayed; A. Nengkoda

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Dual filler nanohybrid membrane PSf-TiO₂/rGO for enhancing nanofiltration performance in rubber wastewater treatment

Tutuk Djoko Kusworo; Andri Cahyo Kumoro; Dani Puji Utomo; Lutfi Mia Wulandari

AIP Conference Proceedings 2667, 060006 (2023) doi: https://doi.org/10.1063/5.0112318

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Paperboard adhesive from glutinous rice flour

Mahreni Mahreni; I. Gusti Agung Darma Putra; I. Nyoman Dipa Swagotra Harijaya

AIP Conference Proceedings 2667, 060007 (2023) doi: https://doi.org/10.1063/5.0114131



Waste management design based on masaro technology for zero waste ITB campus and waste circular economy



Moving bed biofilm reactor (MBBR) with green bed media as water treatment system in aquaculture application

Dessy Ariyanti; I. Nyoman Widiasa

AIP Conference Proceedings 2667, 060010 (2023) doi: https://doi.org/10.1063/5.0112206



BIOPROCESS AND BIOCHEMICAL ENGINEERING

The potentials of carbonaceous domestic waste for the production of highly valuable microbial enzymes through aerobic fermentations – A review case of Southeast Asia

Andri Cahyo Kumoro; Diah Susetyo Retnowati

AIP Conference Proceedings 2667, 070001 (2023) doi: https://doi.org/10.1063/5.0112261



Effect of UV-C irradiation on polyhydroxybutyrate and cphycocyanin production from *Spirulina platensis* growing on palm oil mill effluent

M. M. Azimatun Nur; T. M. Setyoningrum; B. Alfitamara

AIP Conference Proceedings 2667, 070002 (2023) doi: https://doi.org/10.1063/5.0113607



Effectiveness of variety of metal nanoparticle as antibacterial on natural rubber latex foam: A review

Andre Pranata; Maulida Lubis; Ayuni Yustira; Hafifuddin Arif

AIP Conference Proceedings 2667, 070003 (2023) doi: https://doi.org/10.1063/5.0113201





CHEMICAL REACTION ENGINEERING AND CATALYSIS

Methanol dehydration into dimethyl ether (DME) simulation in fixed bed reactor

Mochtar Yadi Santoso; Naufal Asyraf; Melia Laniwati Gunawan; Jenny Rizkiana

AIP Conference Proceedings 2667, 080001 (2023) doi: https://doi.org/10.1063/5.0116541



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Widayat Widayat; Leonardo Subianto; Syifa Nur Alfina; Sri Wahyuni; Faustina Alda Nurushofa

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The effect of binder concentration on characteristic of pellet catalyst

Norman Iskandar; Sulardjaka Sulardjaka; Syaiful Syaiful; Widayat Widayat *AIP Conference Proceedings* 2667, 080007 (2023) doi: https://doi.org/10.1063/5.0112560

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MODELLING, SIMULATION, CONTROL AND ANALYSIS OF MANUFACTURING PROCESSES

The prediction of cone-jet formation in electrospray method using computational fluid dynamics (CFD)

Tantular Nurtono; Evan Grady; Nurdiana Ratna Puri; Lailatul Qomariyah; W. Widiyastuti; K. Kusdianto; Sugeng Winardi

AIP Conference Proceedings 2667, 090001 (2023) doi: https://doi.org/10.1063/5.0113885



Simulation and modelling of torrefaction and activation of oil palm trunk to produce activated charcoal

Dendy Adityawarman; Monica Stephanie Tiolina Siagian; Fira Agfarika Susilowati; Retno Gumilang Dewi; Johnner P. Sitompul

AIP Conference Proceedings 2667, 090002 (2023) doi: https://doi.org/10.1063/5.0130142



Simulation and optimization of steamflood by intermittent injection and by using CO_2

A. A. Pramana; W. N. Erwin

AIP Conference Proceedings 2667, 090003 (2023) doi: https://doi.org/10.1063/5.0112295



An experimental and numerical study of the effect of solar chimney inclination on room ventilation

Suad Hassan Danook; Hussein A. Z. AL-Bonsrulah; Dhinakaran Veeman; M. V. Reddy

AIP Conference Proceedings 2667, 090004 (2023) doi: https://doi.org/10.1063/5.0112302

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SUSTAINABLE DEVELOPMENT AND HIGHER EDUCATION IN CHEMICAL ENGINEERING

Sustainable and integrated industrial wastewater treatment as a base of green industry 4.0

Rame Rame; Purwanto Purwanto; Sudarno Sudarno

AIP Conference Proceedings 2667, 100001 (2023) doi: https://doi.org/10.1063/5.0112441



Study of Doping Sn Atom in Silicene Nanoribbons in The Presence of an External Electric Field

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Abstract. Silicene has been studied extensively in recent years due to its compatibility with silicon semiconductors. Silicene nanoribbons are one-dimensional structures made of silicene with edges modified by chemical elements, in this study the edges are modified by hydrogen. There are two configurations studied here, the top configuration and the valley configuration, the element doped here is tin. The system is placed in an external electric field of magnitude 0.4V/Angstrom, the presence of an electric field also changes the structural properties of the system. The densities of states and energy band structures of the configurations will be plotted, discussed, and studied.

INTRODUCTION

The world changes from micro to macro due to the emergence of new low-dimensional semiconductors. New low-dimensional semiconductors bring many new effects, applications create many new products with high performance, and bring many economic benefits [1]. Silicene is a two-dimensional material with many graphene-like properties [2,3]. Scientists have seen the honeycomb structure of silicene for the first time and predicted a promising material. The creation of the first silicene opened up a research direction with enormous applications [4-8]. The first applications of silicene were made, which was one of the turning points in silicene research [9]. Studies have shown that the energy band structure of silicene can be tuned by atomic doping and the influence of the external field [10-15]. Silicene nanoribbons (SNRs) with hydrogen-modified edges are one-dimensional materials that are also of interest to many scientists [16-19]. The SNRs studied here have 12 Si atoms and 4 H atoms per unit cell. We proceed to doping one Sn atom per unit cell, changing the doping site produces different configurations. There are two configurations studied here, the top configuration and the valley configuration. Doping another element helps to adjust the band gap and change the state density of the system. The electric field carries energy and momentum, the external electric field is also the cause of changes in the energy band structure of the system. The entire doped system is placed in an external electric field, the magnitude of the external electric field is 0.4V/Angstrom. The research will pave the way for future applications in sensors and nanochip technology.

CONFIGURATIONS AND FORMATION ENERGY

Figure 1 is the configuration of the system without doping, the initial configuration of the system, this configuration consists of 12 Si atoms and 4 H atoms per unit cell. The largest and smallest distances between Si molecules are 2.278Angstrom and 2.218 Angstrom, respectively, its buckling is 0.538Angstrom. Figures 2 and 3 are top and valley doped configurations, respectively. Each configuration has one doped Sn atom per unit cell. The formation energy of the doped system is calculated by the formula [20]:

$$E_{\rm F} = E_{\rm t} - E_{\rm p} + E_{\rm Si} - E_{\rm Sp} \tag{1}$$

Here E_F is the formation energy; E_p is the energy of the pristine system; E_{Si} and E_{Sn} is the energy of the free atoms Si, Sn, respectively.

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An Experimental and Numerical Study of the Effect of Solar Chimney Inclination on Room Ventilation

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Abstract. Experimental and numerical analysis has been carried out using the solar chimney to improve the natural room ventilation and thermal performance. MATLAB programming has been used to simulate the natural phenomenon. The climatic conditions of the city of Kirkuk-Iraq has been considered for this study. The thermal efficiency of the solar chimney has been studied at various inclination angles such as 30° , 45° , and 60° with the solar chimney facing south. The solar chimney at a 60° angle, according to the data, yields the better thermal performance and ventilation rate. In this study, it was discovered that wind speed and solar intensity have a greater impact on ACH. Finally, the error percentage among the numerical prediction and the experimental calculation has not exceeded 5%

INTRODUCTION

Passive ventilation method, an effective way to protect environment, has created strong attention for improving indoor thermal environment, save energy and building cost in the current scenario. Natural ventilation is known as effective sustainable building design strategies. Reducing the energy consumption will be a sustainable strategy that can enhance the natural ventilation using solar chimney for a building. Thermal energy can be converted into kinetic energy by enhancing natural draft device called solar chimney. It uses the solar radiation for heating the air inside the chimney. The building can be ventilated by allowing hot air to rise through a chimney channel. Many researchers have conveyed othe performance of solar chimneys in ventilation applications.

The researchers Jubear and Dhahi [1] used a complex model of the solar roof chimney with various inclination degrees (300, 450, and 600) in the south and west directions to investigate the solar chimney inclination angle for room ventilation numerically. The best thermal performance and ventilation rate are predicted to be at a 450-degree angle. In an analytical and simulation study of solar chimney utilization for room natural ventilation, the researchers Bassiouny and Koura [2] looked at several engineering parameters such as the size of the chimney entry and breadth, which are seen to have a major impact on space ventilation. When compared to the size of the chimney intake, the width of the chimney has an effect on flow rate and ACH. Mathur et al. [3] studied the efficacy of an inclined roof solar chimney for summer natural ventilation, finding that the optimal absorber inclination varied between 400 and 600 degrees depending on latitude. The number 450 has been shown to be the most effective for achieving the highest rate of ventilation in India. Mahdavinejad et al. [4] studied the effect of a tilt angle on solar chimneys in numerous Iranian towns, and they discovered that a tilt angle of 45° for the solar chimney provided the

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