The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014 (ScieTech 2014)

Conference Book

ScieTech 2014

The Exchange Room, 5th Floor, Media Hotel, Jakarta Indonesia
Jl. Gunung Sahari Raya No 3
Jakarta 10720 – Indonesia

13 – 14 January 2014

Instructions for Presenters

JOURNAL OF PHYSICS: CONFERENCE SERIES

2014 International Conference on Science & Engineering in Mathematics, Chemistry and Physics (ScieTech 2014)
The Exchange Room, 5th Floor, Media Hotel, Jakarta Indonesia
Jl. Gunung Sahari Raya No 3
Jakarta 10720 – Indonesia

The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014 (ScieTech 2014)

1. Please check this Program for your presentation time(s) and room(s). Please go to the room five minutes before the session starts and report to the Session Chair.
2. Please do not exceed your allotted time. Please follow the instructions of the Session Chair.
3. If the Session Chair(s) is/are absent from the session, the last speaker should serve as the Session Chair.

Instructions for Session Chairs

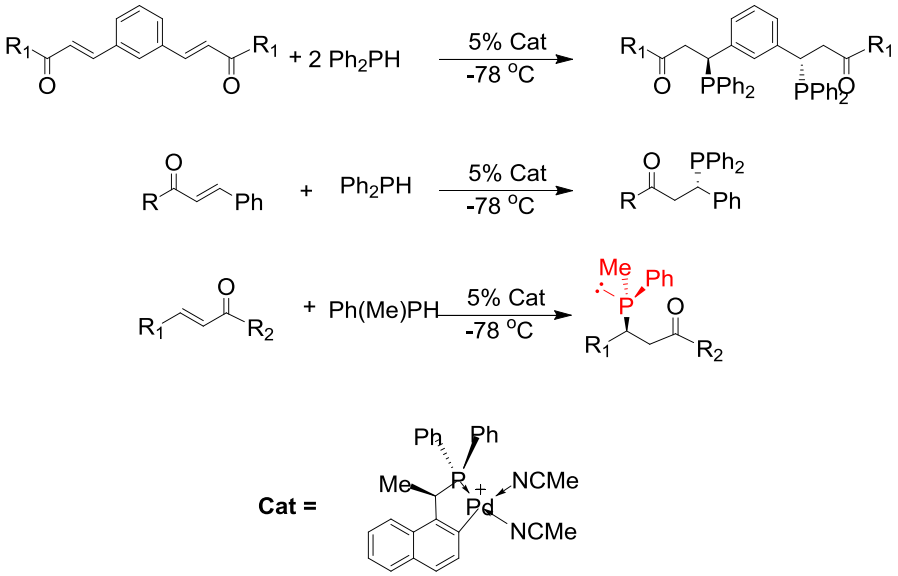
Session chairs are kindly requested to do the following:
1. Calculate the time allocated for each paper in your session. The time allocated to a paper may be different in different sessions, due to uneven distributions of papers in different areas (the number to the left of a session in the "Conference Program" next page shows the number of papers allocated to this session) and a small number of absentees due to visa and other reasons.
2. Arrive at the room of the session five minutes before the session starts and identify each of the speakers for the session.
3. Do not allow presentations or the subsequent discussions to run beyond the starting time of the next presentation.
4. If the presenter of a paper is absent ("no-show"), please continue to the next presentation. Please check again at the end of the last presentation whether the "no-show" turns up. Best efforts have been made to reduce the number of no-shows; however, they may not be eliminated.
5. Each oral presentation room is equipped with an LCD projector. If something is not working properly, please contact conference staff.

Keynote Speaker

Keynote title:
Palladacycle Catalyzed Asymmetric P-H Addition Reactions

Speaker:
Professor Pak-Hing LEUNG
Nanyang Technological University

Abstract:
Chiral aza- and phospha-palladacycles are found to function as highly efficient catalysts for the asymmetric P-H addition reaction. The versatile protocol allows for the asymmetric hydrophosphination of olefenic C=C bonds thus yielding a family of tertiary C*-phosphines as well as C*P*-phosphines and diphosphines, depending on the nucleophile employed. The addition of two equivalents of $HPPh_2$ to symmetrical bifunctionalized alkynes leading to generation of two new C* centers is also achievable. The air-sensitive nucleophiles and the unsaturated substrates containing unprotected functionalities such as aldeyhde, keto, ester, cyano and alcohol can be utilized directly under this mild and facile reaction conditions. The methodology is equally efficient when applied to the generation of P-N ligand systems *via* hydrophosphination of unsaturated pyridyl-based substrates as well as systems with C=N moieties. This synthetic strategy therefore offers to be a versatile approach for the generation of a wide range of chiral tertiary phosphine ligands with potential applications in further catalytic processes.



About the Speaker:

Professor Pak-Hing LEUNG (梁 百 興) was born in Hong Kong (1956). Tertiary Education: Polytechnic of North London (BSc Hons 1982, FYP supervisor: Peter A Tasker), Australian National University (PhD 1986, supervisor: S. Bruce Wild), University of Toronto & University of Chicago (posdoc fellow, 1987-1989, supervisor: Brice Bosnich). He was Professor and Deputy Head of the Department of Chemistry at the National University of Singapore till 2005 after which he was invited to be the founding Head of the Chemistry Division of the new School of Physical and Mathematical Sciences (SPMS) at the Nanyang Technological University, Singapore. He has served as Vice-Dean at SPMS and Head of the Division of Chemistry and Biological Chemistry. So far, he has received a University Researcher Award (NUS, 1998), 14 Teaching Awards (since 1993, both from NUS and NTU). He has published more than 140 peer-reviewed articles in the area of asymmetric synthesis, stereochemistry of phosphorus and organometallic compounds

The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014 (ScieTech 2014)

Title :
Mathematical Models of HIV/AIDS and Opportunist Diseases.

Speaker :
Prof. (Dr.) Nita H. Shah
Professor in Mathematics
Department of Mathematics,
Gujarat University
Ahmedabad, Gujarat, India

Abstract;
Mathematical models help in understanding the population dynamics of HIV/AIDS. An epidemic is defined as an outbreak of a disease that infects a substantial portion of the community. In twentieth century, HIV/AIDS has created a havoc killing millions globally. Once infected, infective virus remains silent for 8 - 10 years, without any symptoms of HIV infection. This period is known as latent period. During this latent period, person's immune system and CD4+ cells get severely damaged by the virus resulting loss of fighting immunity against diseases. At this stage, person is diagnosed To have AIDS. Because of low immunity, patient catches malaria, tuberculosis opportunist diseases very easily.
In this talk, aim is to develop transfer flow for the diseases in different compartment; viz. susceptible, exposed, infective etc. through differential equations. The basic reproduction number will be discussed. Using control theory, disease free equilibrium is derived which is locally asymptotically stable. Simulation study is discussed to predict the dynamics of HIV/AIDS with opportunist diseases.

About the Speaker:

Dr. Nita H. Shah is Professor of Mathematics in Department of Mathematics, University School of Sciences, Gujarat University, India. Her research interest is in Operations Research and in particular, Modelling real life problems. She hold PhD from Gujarat Universty and Post Dodctoral Fellow from University of New Bruncwick, Canada. She ahas published more than 5 books in the area of Mathematics.

Title :

Higher grading affine Toda solitons from quantum algebras.

Speaker :

Dr. Alexander Zuevsky,
Senior Researcher, Czech Academy of Science, Prague, Czech Republic

Abstract:

We construct special types of quantum soliton solutions using quantum Lie algebras associated to affine Lie algebras

About the Speaker:

Dr Alexander hold PhD from Moscow institute of physics and technology in the area of Mathematical Physics. His research interest are Representation theory:, Automorphic Forms, Mathematical Physics. He is Senior Researcher, Czech Academy of Science, Prague, Czech Republic and member International Association of Mathematical Physics. He has Research Fellowships, Max-Planck Institut für Mathematik,Bonn and

The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014
(ScieTech 2014)

Conference Program

	Notes/Session ID	
Day 1: 13 January 2014		
08:00 - 09:00	Registration Starts (available for 2 days)	
09:00 - 09:10	Opening by General Chair	
09:10- 09:40	Keynote Speaker : Professor Pak-Hing LEUNG - Palladacycle Catalyzed Asymmetric P-H Addition Reactions	
09:45 - 10:15	Keynote Speaker : Professor Nita H. Shah- Mathematical Models of HIV/AIDS and Opportunist Diseases	
10:15 - 10: 45	Photo Session & Coffee Break	
10: 45 - 12:00	Sessions: Chemistry	
	102	Linear free energy relationship and Deuterium kinetic isotope effect observed on Phospho and thiophosphoryl transfer reactions in some organophosphorous compounds
	117	temperature effects on diffusion coefficient for 6-gingerol and 6-shogaol in subcritical water extraction
	124	The selection reaction of homogeneous catalyst in soy-epoxide hydroxylation
	143	The Evaluation of Hydroxyapatite (HA) Coated and Uncoated Porous Tantalum for Biomedical Materials Applications
	154	On the Marangoni Instability in Gas Absorption
	156	Selective fermentation of pitted dates by S. cerevisiae for the production of concentrated fructose syrups and ethanol
12;00 - 13:00	Lunch Break	
13:00 - 15:00	Session : Physics 1	
	101	New View of the Relativity Theory
	114	The Space-Time Model According the Dimensional Continuous Space-Time Theory
	104	The New Big Bang Theory according to the Dimensional Continuous Space-Time Theory
	158	The development of GPS TroWav tool for atmospheric – terrestrial studies
	159	Analysis distribution of galactic cosmic rays particle energy with polar orbit satellite for Geant4 application
	160	Forecasting the Earth's Trapped Particle Distribution Using Hierarchical Bayesian Spatio Temporal Model
	161	Spatial Analysis of Galactic Cosmic Ray Particles in Low Earth Orbit/Near Equator Orbit Using SPENVIS
	128	Instantaneous and scale-versatile gourdron theory: pair momentum equation, quasi-stability concept, and statistical indeterminacy revealing masses of elementary,

		bio-molecular, and cosmic particles
	113	The Influence of BTO-BHF Different Composition on its Ferroelectric Properties
	118	Intrinsic Hysteresis Loops Calculation of BZT Thin Films
	131	Using Adaptive Filters for GPS Receivers
15:00 - 15:15	Coffee Break	
15:15 - 18:15	Sessions: Physics 2	
	106	Development of CMOS Imager Block for Capsule Endoscope
	120	Applicability of nano zero valent iron (nZVI) in sono-Fenton process.
	122	Designing Process Improvement of Finished Good On Time Release and Performance Indicator Tool in Milk Industry Using Business Process Reengineering Method
	123	Performance Evaluation of a Drilling Project in Oil and Gas Service Company in Indonesia by MACBETH Method
	126	The Influence of Basic Physical Properties of Soil on its Electrical Resistivity Value under Loose and Dense Condition
	132	REVIEW ARTICLE: Recent Advances in Nanomaterials Fabrications
	136	Low Wireless Power Transfer Using Inductive Coupling For Mobile Phone Charger
	137	Effects of Taiwan Roselle anthocyanin treatment and single-walled carbon nanotube addition on the performance of dye-sensitized solar cells
	139	Weldability of A7075-T651 and AZ31B dissimilar alloys by MIG welding method based on welding appearances
	148	Electrical Conductivity Characteristics of TiO2 Nanowires From Hydrothermal Method
	149	10 GHz Microstrip Spanar Antennas: An Experimental Analysis
	150	Energy Monitoring Based on Human Activity in the Workplace
	164	Phenomena of Foamed Concrete under Rolling of Aircraft Wheels
	175	Ionic Wind Phenomenon and Charge Carrier Mobility in Very High Density Argon Corona Discharge Plasma
19:00 - 20:00	Dinner Banquet	

The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014 (ScieTech 2014)

The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014 (ScieTech 2014)

Conference Program

		Notes/Session ID
Day 2: 14 January 2014		
09:00-09:30	Invited Speaker : Dr Alexander Zuevsky - Higher grading affine Toda solitons from quantum algebras	
09:30 - 09:45	Coffee Break	
09:45 - 12:00	Sessions: Mathematics	
	127	Aitken delta-squared generalized Juncgk-type iterative procedure
	130	Optimal Cycle Time and Preservation Technology Investment for Deteriorating Items with Price-sensitive Stock-dependent Demand Under Inflation
	138	SOLUTION OF ONE PHASE INVERSE STEFAN PROBLEM BY IEF METHOD
	146	Numerical Solutions of Free Convection Boundary Layer Flow on a Solid Sphere with Convective Boundary Conditions
	147	IDENTIFYING POTENTIAL MISFIT ITEMS IN COGNITIVE PROCESS OF LEARNING ENGINEERING MATHEMATICS BASED ON RASCH MODEL
	152	A Survey on Human Behavior Towards Energy Efficiency for Office Worker in Malaysia
	151	Application of Genetic Algorithm to the Design Optimization of Complex Energy Saving Glass Coating Structure
	153	Implicit finite difference solution for time-fractional diffusion equations using AOR method
12;00 - 13:00	Closing & Lunch Break	
19:00 - 20:00	Dinner Banquet	

JOURNAL OF PHYSICS: CONFERENCE SERIES

The 2nd International Conference on Science & Engineering in Mathematics, Chemistry and Physics 2014
(ScieTech 2014)

Conference Location

Media Hotel & Towers.


Close to north Jakarta's must-sees, including its world-class shopping district Mangga Dua, and the city's flourishing business and manufacturing districts, The Media Hotel & Towers is a luxury 5-star hotel in Jakarta with easy access to the Jakarta International Expo and the Jakarta International Airport.

Created to be mini retreats, our 350 hotel guest rooms have everything for a wonderful night. With facilities as 4 different restaurants, 2 lounges, a spa and fitness centre and multiple function rooms, The Media Hotel & Towers is the perfect location for a memorable stay.

Oxventus Kumala (MR)
Account Manager

THE MEDIA HOTEL & TOWERS
Jl. Gunung Sahari Raya No. 3, Jakarta 10720, Indonesia
t - 62 21 626 3001 m - 62 812 9878 9968 f - 62 21 626 3011
E-Mail: oxventus.kumala@themediahotel.com
Facebook: www.facebook.com/themediahotel
Twitter: @themediahotel
Website: www.themediahotel.com
Mobile Website: http://mobile.themediahotel.com
BlackBerry PIN: 29F57CB0

Destination Information

Jakarta is the Capital City of The Republic of Indonesia, a country composed of more than 13.000 islands with a population of over 180 million. Jakarta is a special territory enjoying the status of a province, consisting of Greater Jakarta, covering of 637.44 square km area. Strategically positioned in the archipelago, the city is also the principal gateway to the rest of Indonesia. From the Capital City, sophisticated land, air and sea transport is available to the rest of the country and beyond.

Jakarta is a city of contrast; the traditional and the modern, the sacral and the wordly, often stand side by side in this bustling metropolis. Even its population gathered from all those diverse ethnic and cultural groups, which compose Indonesia, are constantly juxtaposed present reminder of the national motto, Unity in Diversity.

2014 International Conference on Science & Engineering in Mathematics, Chemistry and Physics (ScieTech 2014)

To cite this article: 2014 *J. Phys.: Conf. Ser.* **495** 011001

2014 International Conference on Science & Engineering in Mathematics, Chemistry and Physics (ScieTech 2014)

Media Hotel, Jakarta, Indonesia, 13 - 14 January 2014

Preface

2014 International Conference on Science Engineering in Mathematics, Chemistry and Physics (ScieTech 2014), was held at the Media Hotel, Jakarta, Indonesia, on 13–14 January 2014.

The ScieTech 2014 conference is aimed to bring together researchers, engineers and scientists in the domain of interest from around the world. ScieTech 2014 is placed on promoting interaction between the theoretical, experimental, and applied communities, so that a high level exchange is achieved in new and emerging areas within Mathematics, Chemistry and Physics.

We would like to express our sincere gratitude to all in the Technical Program Committee who have reviewed the papers and developed a very interesting Conference Program as well as the invited and plenary speakers.

This year, we received 187 papers and after rigorous review, 50 papers were accepted.

The participants come from 16 countries. There are 5 (Five) Paralell Sessions and Four Keynote Speakers.

It is an honour to present this volume of *Journal of Physics: Conference Series (JPCS)* and we deeply thank the authors for their enthusiastic and high-grade contributions. Finally, we would like to thank the conference chairmen, the members of the steering committee, the organizing committee, the organizing secretariat and the financial support from the conference sponsors that allowed the success of ScieTech 2014.

The Editors of the Scietech 2014 Proceedings:

Dr. Ford Lumban Gaol
Dr. Benfano Soewito
Dr. P.N. Gajjar

Table of contents

Volume 495

2014 « previous issue next issue »

2014 International Conference on Science & Engineering in Mathematics, Chemistry and Physics (ScieTech 2014)
13–14 January 2014, Jakarta, Indonesia

Accepted papers received: 4 February 2014
Published online: 4 April 2014

Preface

Papers

Journal links

Journal home
Information for organizers
Information for authors
Information for readers
Search for published proceedings
Contact us

View by subject

All Subjects

All Dates

All journals
This journal only

The selection reaction of homogeneous catalyst in soy-epoxide hydroxylation

Flora Elvistia Firdaus

Jayabaya University, Jl. Pulomas Selatan Kav 23 Jakarta -13210 Indonesia

flora_elvistia@yahoo.com

Abstract. Hydroxylation reaction of soy-epoxide has resulted soy-polyol; a prepolymeric material for polyurethane. The conversion and selectivity of soy-epoxide butanol based to hydroxylation was found higher than soy-ethylene glycol (EG) based. These reactions were performed by sulfur acid which commonly known as homogeneous catalyst. Conversion and selectivity of homogeneous catalyst compared to bentonite; a heteregeneous catalyst was lower as in fact the mixtures were more viscous. The catalysis were significantly effected to cell morphology. Foams were conducted by heterogeneous catalyst resulted an irregular form of windows while homogeneous catalyst are more ordered.

***Keywords*—** polyurethane, conversion, selectivity, soybean, catalyst

1. Introduction

Increasing concerns about the environment and renewable resources are fueling a growing worldwide research effort which bringing significantly economic and scientific importance which impacted to reducing the dependence on fossil fuels which are rapidly being exhausted [1-2]. Vegetable oil-based products are well-known as being environment-friendly, abundant, cheap in cost, and excellent properties. The products can be developed and utilized for valuable polymeric materials [3-5].

Vegetable oils are part of larger family of chemical compounds known as fats or lipids, which made up predominantly of triesters of glycerol with fatty acids which can be processed into high value oleochemicals for various industries [6]. The composition of fatty acids contained in the vegetable oils determines the further use of oils; the conversion of oil seed crops into bioplastic could compete with plastics from petroleum chemicals [7-9]. Transformed of fatty acids into polyol through double bonds epoxidation and oxirane ring opening are used in many industries as an additives for polymers as well as composites [10], which have attracted attention for a multitude of plastic products, including polyurethanes [11-14]. The oils are characterized by their oxirane number and hydroxyl value.

Polyurethanes produced from vegetable oils; soybean-oil as well has presented some excellent properties such as hydrolytic and thermal stability.The preparation of polyols from oils have been the subject of many studies but limited attention has been paid to the effect of different alcohols to be used as the ring opening reagents for soy epoxide oil [15-16]. The hydroxyl groups are located in the middle of fatty acid chain resulting a significant steric hindrance to crosslinking. The method of using either electrophiles or nucleophiles, or catalyzed by either acids or bases. Epoxidation with peracetic acid is generally catalysed by soluble mineral acids like sulfur [17]. The reactions catalysed by clays

would be an alternatives which were carried under mild conditions. The separation of the spent catalyst is achieved by filtration, and the product is recovered by mere evaporation of solvent. Catalyst used in polyol production for discontinuous batch process for a common practice is sulfur acid [18]. The effectiveness of catalyst in promoting reaction to ethylene glycol (EG) and n-butanol were found 15.6% respectively at same condition [19].

The optimum conversion of epoxide to polyols of using homogeneous catalyst were found at the previous, by temperature 50C was 150 minutes of reaction, while at 60C was 90 minutes of reaction. The best oxirane number found at this conditions was 6.7 (%) [20].

This paper report works to find out the reaction conditions that allows the addition of different alcohols to epoxidized vegetable oils in maximizing selectivity with the used of homogeneous catalyst as well as heterogeneous in polyurethane synthesis. The reason of using EG and butanol, besides performing as chain extender it is also performed as source of hydroxyl others than soy-polyol.

2.Materials and Methods

2.1Material specifications

Soy-oil based polyols used in this study were been synthesized in our laboratory using hydroxylation of epoxide methods. Sulfur acid catalysed were carried in the reaction in accordance to a known procedure to a peracetic acid *in situ* which generated from peroxide and acetic acid. The soybean-oil was purchased from grocery, is the product of Variatama Jakarta with specifications of acid value 0,024 mgr KOH/ gr sample, Iodine value 53,89 gram Iod/100 gr sample, and viscosity 443.007 cps.

3.Result and Discussion

3.1.Preparation of Flexible PU Foam

Hydroxyl groups were introduced by applying two-step methods involving epoxidation of unsaturated chain followed by epoxide ring opening. Chain extender (ethylene glycol, butanol) were taking part in the epoxidations and the amount of catalyst to be used is 1% (v/v). Bentonite was used as the comparative data. The role of these catalysts to polyurethane properties were evaluated.

Polyurethane was prepared using formula by fixing molar ratio of epoxide to chain extenders [1:1]; [1:3]; [1:5]; [1:6] and [1:10] then adding TDI (2.4): MDI (4.4') (80:20) into polyols. The mixtures were vigorously mixed to surfactant and distilled water, which then poured into an open glass mould. The foams removed from the mould and allowed to postcure for one day at room temperature. Oxirane number indicates the epoxide ring has completely reacted in hydroxylation reaction resulted hydroxyl.

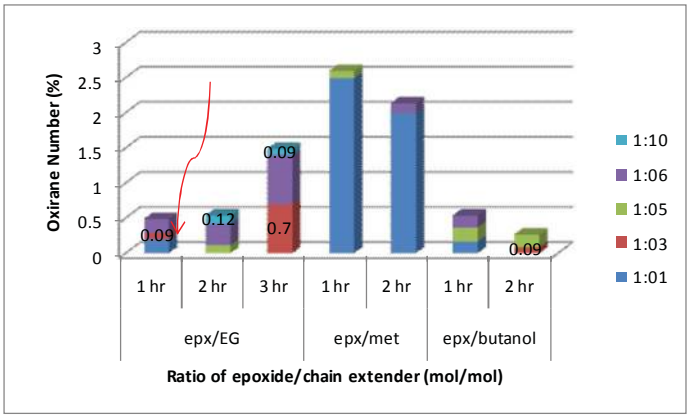


Figure 1. Time of reaction Optimization

The reduction of oxirane number of polyol would caused of increasing hydroxyl value. As can be seen in figure 1. The lowest oxirane number was achieved at concentration of epoxide/ethylene glycol (1:3) at 1 hour and three hour reaction and also at two hour for ratio of epoxide/butanol. Concentration (1:3) was used as based formula for proceed reactions. Hydroxyl value of butanol using sulfur and bentonite are 549.7 mgr KOH/gr and 710 mgr KOH/gr respectively, as compared to EG was 308.5 mgr KOH/gr. High hydroxyl value would caused high consumes of catalyst if further processed to urethane foams.

One of the apparent differences between butanol and EG, which butanol has secondary hydroxyls while EG has only primary hydroxyls. Selecting of polyols for foaming it is well understood that primary hydroxyl are preferred for molded foam process, because the speed up gelling reaction.

3.2.The Catalytic Studies

The effect of polymerization catalyst is illustrated in Figure 1, keeping the weight of sulfur acid at constant for the whole reactions. The product results were compared to as if it is being catalysed by bentonite.

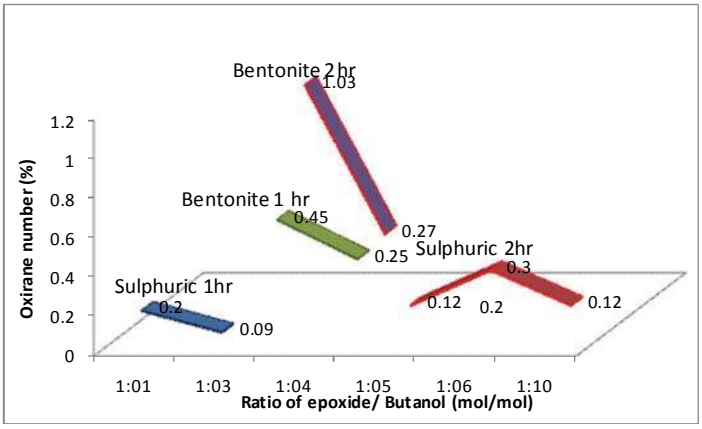


Figure 2. Comparative catalysis existence of epoxidation

Results of the epoxidation of fatty acid catalyzed by H_2SO_4 are displayed in figure 2 and figure 3, with the temperature of 60±0.5C. This figures have clearly explained the conversion and selectivity of epoxidation using butanol are higher than EG.

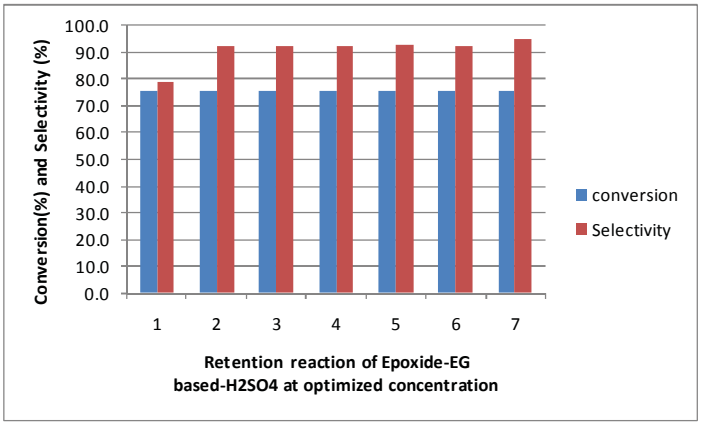


Figure 3. Epoxidation of EG- based with H_2SO_4

The glycols produced as the result reaction of water to epoxide, its formation were favoured by a lower crosslinking. Butanol although has high crosslinking will gives poor selectivity due to glycol formation. The low selectivity were assumed to happened with the decrease of cross-linking.

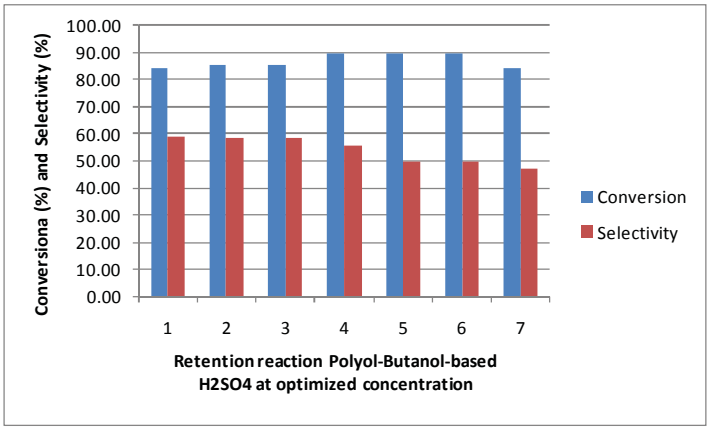


Figure 4. Epoxidation of Butanol-based with H_2SO_4

The viscosity of polyol butanol-based using sulfur acid catalyst were 569.43 cps while viscosity of polyol EG-based using sulphuric acid were 30.55 [21], logically viscosed mixture will find difficulties in the reactions, but referred to this founding the viscosity seems is not effected to conversions and selectivity. For α and β branched alcohols it was possible to improve the selectivity that shown in figure 4. Less complex alcohols it was possible to obtain 100% selectivity at 100% conversion.

The hydroxyl value of polyol butanol- based using sulphuric acid is 549.65 mgr KOH/gram and as to compared to hydroxyl value of polyol butanol-based using betonite catalyst is 710.91 mgr KOH/gram. These differences are met of reactivity and selectivity of the catalyst itself.

3.3. Characterization and Property Measurement of Polyurethane (PU) Foam

The obtained PU foams were characterized by using density measurement, the foams were cut into specimens with dimension of 1x1x1 cm. The specimens were accurately weighed using equation, density = mass/ volume. The density for each foam was ascertained using average value. Many factors and conditions can influence the foaming process of flexible cellular polyurethanes.

Natural oils polyols are significantly different from petroleum-derived polyols, the hydroxyls located in the center of polyol chains. Compared to mostly petroleum-derived polyols, which have either primary hydroxyls and secondary hydroxyls with only one covalent bond removed from the chain ends while for natural oil converted from single oil molecule are most likely to be 5-8 covalent bonds removed from the chain ends, this stated as disadvantages for natural polyol with respect to gelling reaction.

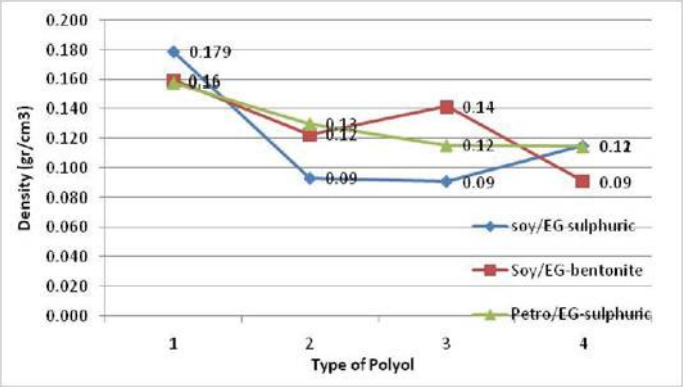


Figure 5. The density of different type of PU Foam

However the theoretical review can be voided to the finding of bentonite as displayed in figure 5. According to Chan-tu there are relationships between foams density and hydroxyl value, foams are made from vegetable oil-based polyols with hydroxyl value below 100 mgr KOH/gram, or polyol mixture having OH_m lower than 292 usually shrank within days of storage [22].

We have tried to analyse the data using outlier test, the possibility of existence density data of soy/EG using sulfur at 0.09 and 0.179, and for soy/EG using bentonite at 0.12 are not in the range distribution to the rest data by using Grubbs's (G) equation [23]. ($X_{suspect}$) values are considered to be at the extremes of the data, $\bar{x}$; mean of the data, and s standard deviation.

$$G = \frac{|\quad\quad|}{\quad\quad} \qquad (1)$$

For soy/EG sulfur the $x_{suspect}$ was 0.09 with $G_{suspect}$ 0.7156 and $x_{suspect}$ 0.179 with $G_{suspect}$ 1.44 and for soy/EG bentonite the $x_{suspect}$ was 0.12 with $G_{suspect}$ 0.1142. G value then compared to tables of critical for G at $\alpha = 0.05$, If $G_{suspect} > G_{critical}$ then the suspect can be rejected. From this investigation all of the $G_{suspect} < G_{critical}$. It means that all previously $x_{suspect}$ data are in the range of foam density.

The density of using heterogeneous is seem to be much promising. It works in the surface acidity which promotes to an optimum hydroxylation reaction. Although surface area of catalyst are very critical to determine the catalytic site, but it was suitable for the soy-polyol synthesis.

3.4. Cell Morphology

SEM micrograph using of cured solid polyurethane were examined and the average cell diameter are shown in figure 5 a,b and figure 6 a,b. The foam occurred by homogeneous (sulfur) calatlyst at previous hydroxylation has large average cell size with widen cell size distribution. However the cell was in ordered form. Using heterogeneous (bentonite) catalyst in the synthesis has resulted an irregular form.

The hydroxyl value are related to gelling reaction, using heterogeneous is found to be higher than homogeneous. In extreme case the slow gelling reaction could cause foam to collapse during curing. The selectivity obtained using bentonite is poor, value below 40% is implied to incompletion of soybean-oil conversions. The foaming process evidently did not change, however the final morphology unveiled by the characterization study.

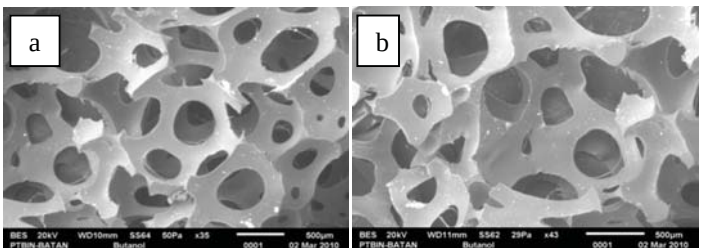


Figure 5 a,b Images of Polyurethane foam using H_2SO_4 catalyst

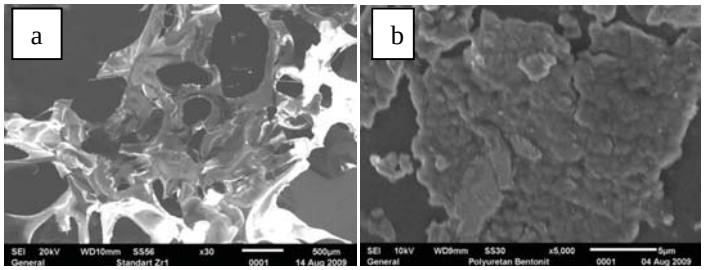


Figure 6 a,b Images of Polyurethane foam using bentonite catalyst

Conclusions

It is found the type of catalyst in polyol synthesis are effected to density, cell morphology, and to other properties of polyurethane as well. The aim of using alcohols in the polyol synthesis are synergize to the optimum existence of catalysis. Catalyst performance in natural oil can void the doubt of using soy-based for future polyurethane manufacture, which can replace petro-based polyol.

Acknowledgement

The authors gratefully acknowledge the support of the Indonesia Department of higher education (Dikti- Kementerian Pendidikan dan Kebudayaan Republik Indonesia) as funding the research.

References

[1] Sperling L.H., Manson J.A. (1983) Interpenetrating polymer networks from triglyceride oils containing special functional groups- a brief review. J Am Oil Chem Soc 60:1887-1892.
[2] Guidoti *et. al*., (2003), Heteregeneous catalytic epoxidation of fatty acid and methyl esters on titanium grafted silicas, Green Chem, 5, pp, 421-424.
[3] Narine S.S., Kong X, Bouzidi L, Sporns (2007) Physical Properties of Polyurethanes produced from Polyols from seed oils: I. Elastomers. J.Am.Oil Chem Soc 84:55-63
[4] Narine S.S., Kong X., Bouzidi L., Sporns (2007), Physical Properties of Polyurethanes produced from Polyols from seed oils: II. Elastomers. J.Am.Oil Chem Soc 84: 65-72
[5] Lin B., Yang L., Dai H., Yi A. (2008), Kinetic Studies on oxirane cleavage of epoxidized soybean oil by methanol and characterization of polyols, J. Am Oil Chem Soc 85:113-117
[6] Pryde EH, Princern LH. Mukherjee K.D. (eds) (1981), New sources of fats and oils (American Oil Chemists Society Monograph no. 9). American Oil Chemists Society, Champaign, IL.
[7] Hong Hu Y., Gao Y., Wang D.N., Hu C.P., Zu S., Vanoverloop L. and Randall D. (2005), Journal of Applied Polymer Science, 84, p. 591

[8] Badri K.H, Ahmad S.H and Zakaria S. (2001), Journal of Applied Polymer Science, 81, p.384
[9] Zlatanic A, Lava C, Zhang W. and Petrovic Z (2004), Journal of Polymer Science, Part B: Polymer Physics, 42, p.9
[10] Nayak P.L. (2000) natural oil based polymers: opportunities and challenges. J Macromol Sci Rev Macromol Chem Phys C 40:1-21
[11] Khoe T.H., Otey F.H., Frankel E.N. (1972) Rigid urethane foams from hydroxymethylated linseed oil and polyol esters.J Am Oil Chem Soc 49: 615-618
[12] Hu Y.H., Gao Y., Wang D.N., Hu C.P., Zu S., Vanorverloop L., Randall D.(2002) Rigid polyurethane foam prepared from a rapeseed oil based polyol, J Appl Polym Sci 84: 591-597
[13] Dwan 'Isa L.J.P., Mohanty A.K, Misra M., Drzal L.T, Kazemizadeh M. (2003) Novel biobased polyurethanes synthesized from soybean phosphate ester polyols thermomechanical properties evaluations, J polym Environ 11, 161-168
[14] Guo A., Demydov D., Zhang W., Petrovic Z.S. (2002) Polyols and polyurethanes from hydroformylation of soybean oil. J Polym Environ 10: 49-52
[15] Goud V.V., Patwardhan A.V., Pradhan N.C. (2006), Studies on the epoxidation of Mahua oil (*Madhumica Indica*) by hydrogen peroxide, Bioresource Technology 97: 1364-1371
[16] Honghai D., Liting Y., Bo L., Chengsuang W., and Guag S. (2009), Synthesis and characterization of the different soy-based polyols by ring opening of propanediol, J Am Oil Chem Soc, 86: 261-267
[17] Trahanovsky N.S(1978) : Oxidation in Organic Chemistry, 5, Part C, Chapter 3, Academic Press, New York, pp. 211-294
[18] Inui K., Kurabayashi T, Sato S, Ichikawa N (2006), J. Mol Catal. A, 216; 147
[19] Lubguban A.A (2009); Synthesis and Testing of Soy-based polyols: Phospate and Glycerolysis Oligomers; Dissertation
[20] Flora Firdaus, E., (2011), Optimization of soy epoxide hydroxylation to properties of prepolymer polyurethane,World Academy of science engineering and technology, p.81
[21] Flora Firdaus, E., (2012), The type of catalyst to physical properties of soy-based polyurethane, J Chem. Chem. Eng. 6
[22] Chan Tu-Y.(2008), Polyurethane Foams from Novel based Polyols, Dissertation Univ. Of Missouri
[23] Brynn Hibbert D. and Justin Gooding J. (2006), Data Analysis for Chemistry: An Introductory Guide for Students and Laboratory Scientist, Oxford University Press, p.80