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PROCEEDINGS BOOK

THE INTERNATIONAL CONFERENCE ON BASIC SCIENCE 2011



**Theory and Application of Mathematics,
Biology, Chemistry, and Physics in Health,
Environment, and Advance Technology**

**Widyaloka Convention Hall
University of Brawijaya
Malang, Indonesia
February 17-18th 2011**

International Conference on Basic Science (ICBS)

“The Role of Basic Science in Health, Environment, and Advance Technology”

Faculty of Science, University of Brawijaya, Malang, Indonesia

Widyaloka Convention Hall, February, 17 – 18th 2011

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2. Dr. Edgar Paski – British Columbia Institute of Technology (Canada)
3. Prof. Dr. Lukman Hakim – Indonesian Institute of Science (Indonesia)
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PREFACE

Proceeding of the International Conference on Basic Science 2011 is a book containing several papers that have been presented in the seminar, either oral or in poster. The objective of this proceeding is to collect and to share any useful information that had been gathered recently in area of Mathematics, Biology, Chemistry and Physics, which is generally known as the basic science. Hence, through this book the readers are expected to gain new knowledge or information, especially in health, environment and advance technology.

In general, the papers are presented in order of health (part A), environment (part B) and advance technology (part C) in which in each part the papers are divided into two sections, the oral and poster papers. Many papers in this proceeding discuss the exploration and the development of natural resources as the medicine based compound source. Furthermore, the modification of analyzing method and modeling in health and environmental science, whether it is based on nuclear technology or advance biotechnology, has also been compiled in this proceeding. In addition, several interesting topics which present the latest information in environmental field add the usefulness of information gathered in this proceeding.

Additional information of the first author is also given at the end of this book. Hence further contact to the author is possible via the email address available at the affiliation section. Should the readers have further questions, comments or need more information, please directly contact the authors of the papers.

The editorial board has made some editing correction needed in some cases. Most of the editing correction are conducted and concentrated in the organization of the paper based on the guideline and the language, i.e. some figures or tables were corrected, or maybe printed in grayscale, and placed in the last part of the article (appendix). In addition, the language is the most time-consuming work; hence we apologize for the late publishing of this book and for any inconvenience as a result of the delay.

Lastly, on behalf of the committee, we would like to say thank you to all the participants for their kindness to be part of this conference. We also would like to acknowledge each partnerships and sponsorships that involved during this event. We believe that this proceeding still has some weaknesses; therefore any constructive comments are welcome. Once again, thank you to all, have a nice academic life and see you in the next ICBS.

Malang, May 2011

Message from President of ICBS 2011

Praise to Allah SWT, as only of his love and blessing, **our 1stth International conference on Basic Science (ICBS 2011)** was successfully held on February 17-18th, 2011 in Widyaloka Building University of Brawijaya Malang Indonesia, as one of celebration for the 48th Anniversary University of Brawijaya and the International Year of Chemistry 2011. The conference was projected to facilitate the discussion of the truth and beauty of science and its application to impact positive improvement in health, environment and advance technology for prosperity to the local society and worldwide.

We would like to thank and give highest appreciation to Rector University of Brawijaya and Dean Faculty of Science for their fully support and to **Our honourable and generous keynote and invited speakers:** Dr. Edgar Paski from BCIT & Analytical Innovation Canada; Assoc. Prof. Spas Dimitrov Kolev, from The University of Melbourne, Australia, Prof. Lukman Hakim, Head of Indonesian Institute of Science, Prof. Chandrawati Cahyani from Chemistry Department University of Brawijaya Malang Indonesia, Prof. Brenny van Groesen from University of Twente, Netherlands and LabMath-Indonesia, Bandung Indonesia; Prof. Motoki Kubo and Prof Mamoru Wakayama from Department of Biotechnology, Ritsumeikan University, Japan; Dr. Francois Malherbe from Swinburne University of Technology, Australia. **Another great appreciation goes to the board of editors:** Assoc Prof. Lilibeth Coe from University of Philippines Manila, Prof. Mick O'Neill, the Director Statistical Advisory & Training Services Australia, and Prof. Petr Solich from Charles University Republic of Czech. Many thanks go as well to **all national & international participants** for their contributions to the conference program and to this proceeding. It is our pleasant duty to also acknowledge our sponsors: PT Arfindo Bersinar, CV Makmur Sejati, Indonesian Forestry Department East Java Division, the Local Government of Malang City, Indonesian Chemistry Society, PT. Otsuka Lawang, PT. Amerta Indah Otsuka - Pasuruan, Kristalindo, Trans Zahwaa Travel, Elfara FM and Tugu Hotel **as your strong support and active participation** have made the **1st ICBS becomes a reality.**

The material in this proceeding is divided into three parts: (1) Health, (2) Environment, and (3) Advance Technology. We hope that the papers contained in this proceeding will prove helpful toward improving international collaboration research to solve the problems related to health, environment, and advance technology.

As this conference is held annually, we are looking forward to the 2nd International Conference on Basic Science that will be held on February, 2012 at the same location. We hope that it will be a more interesting and enjoying conference.

President
Dr. Hermin Sulistyarti

Message from Dean of Faculty of Science – UB

On behalf of the faculty of Science we are very happy to complete the **1stth International conference on Basic Science (ICBS 2011)** by this proceeding. Our appreciation to Prof. Dr. Ir. Yogi Sugito, rector of the University of Brawijaya for his support and all of the keynote and invited speakers who made this conference succeeds.

This proceeding contains as the following. Part A: Health, Part B: Environment, and Part C: Advanced Technology. Oral papers are followed by posters at each part. Finally, we would like to thank all of the steering and organizing committee for their efforts in succeeding this conference, especially to Dr. Hermin Sulistyarti as the chair of the organizing committee.

Last but not least for all of the participants, we are thankful for your cooperation, contribution and very valuable support for this event.

Thank you,

Prof. Dr. Marjono, MPhil.

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Developing of Solid Phase Extraction Based on Zeolites: Case Studied Cr(VI)

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Abstract

Chromium especially hexavalent chromium is hazardous to our health, because it is carcinogenic. Therefore, chromium in drinking water should be minimized to less than 50 µg/L. One way to decrease chromium content is using solid phase extraction such as zeolites. Zeolites was modified by cationic surfactant hexadecyltrimethylammonium bromide (HDTMABr) to increase its adsorption capacity. Adsorption capacity of Cr(VI) onto zeolites was 1.90 mg/g, when pH Cr(VI) solutions was 3 and contact time was 18 hours. Adsorption Cr(VI) into zeolites followed Freundlich isotherm equation. The best adsorption capacity of HDTMABr (40.99 mg/g) onto zeolites was achieved when HDTMABr concentration was at 1000 ppm with contact time 30 hours. Adsorption HDTMABr into zeolites followed Langmuir isotherm equation. NaOH 0.5 M dan Na₂CO₃ 0.28 M (1:1 v/v) mixture solutions desorped Cr(VI) about 65.67% (by batch extraction) and 3.93% (by fixed-bed extraction). Properties of zeolite after modified with HDTMABr were shown at 2856.33 and 2927.65 cm⁻¹ peaks, originated from CH₃ on HDTMABr.

Keywords: Piper betle, Piper crocatum, essential oil, tyrosinase activity.

1. Introduction

The hexavalent chromium is present in nature as CrO₄²⁻. It is hazardous to our health, because it is toxic and carcinogenic [1]. The present of chromate ion in the environment caused some problems such as how to monitor the chromate level in the environment especially in water or effluent from industrial waste and what is technology to treat or to reduce the risk of negative effect from Cr(VI), especially in drinking water chromium level should be minimized to less than 50 µg/L

Solid phase extraction had been used to remove or to get the heavy metal residue from component, either in gas, liquid or solid phase. Many solid phases had been used for this purpose, for instance charcoal, resin, and zeolite [2]. Zeolite had been used for treatment of waste. It has pore and rich with cations which can be used as ion exchanged and also as adsorbent.

To increase the ability of zeolite as ion exchanger, modify is needed. On this paper, zeolite was modified with cation surfactant to increase the adsorption capacity. The cation surfactant which used was hexa-decyl-tro-methyl-ammonium (HDTMA) [3]. This research aims were to modify zeolite with HDTMABr and to find the

effectiveness of modified zeolite with HDTMABr based on its activity to absorb Cr(VI).

2. Experimental Details

Sample's material and preparation

Zeolites washed with water, dried in room temperature, and the grinded with mortar. The zeolite powders then filter with filter 60 mesh. Then, powder dried at 300°C for 3 hours.

Activation of zeolite

Zeolite was activated chemically with acid. About 100 g zeolite mixed with 250mL HCl 4.0M for 1 hour. The mixture then washed with water till neutral. The zeolit dried on 400°C for 3 hours. Adsorption isotherm of HDTMABr and modification of zeolite with HDTMABr were performed with method of Giachi [4]. Cation exchange capacity was determined using Klute method [5]. Chromium analysis was performed based on Clesceri method [6], while desorption of Cr(VI) was performed based on Zeng method [7].

Chromate adsorption

Zeolite and modified zeolite about 0.5 g each added with Cr(VI) solution in different concentration (2.0 – 60.0 ppm) at pH 3, 4, 5, 6, and 7. The mixtures then shake at 150 rpm for 18, 20,

22, 24, and 26 hours. After that, the mixture separated with centrifuge and filtration method. The filtrate was analyzed for the concentration of Cr(VI). The adsorption capacity then calculated with equation:

$$Q = \frac{V(C_0 - C)}{m}$$

Q is adsorption capacity (mg/g), V is volume (L), C_0 is initial concentration of Cr(VI) (ppm), C is final concentration of Cr(VI) (ppm), and m is weight of zeolite (g).

Zeolite characterization

Zeolite was characterized before and after modification, and also for zeolite after desorption. Characterization was performed with FT-IR Spectrum One Perkin Elmer.

3. Result and Discussion

The adsorption capacity of HDTMA+ increased significantly about 20.99 mg/g from 0 to 1000 ppm (Figure 1). When HDTMA+ concentration is higher than 1000 ppm, the adsorption capacity increased slowly. HDTMA+ adsorption capacity at concentration 1000 ppm obtain at 30 hours contact time, decreased at 42, 45, and 48 hours.

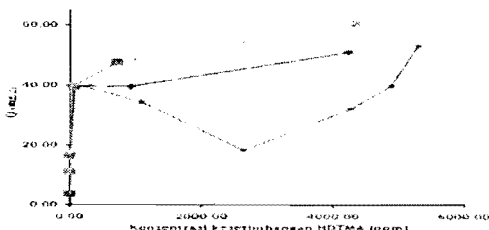


Figure 1. Curve of adsorption capacity of HDTMA on different contact time (●) 24 hours, (×) 30 hours, (◆) 42 hours, (⊗) 45 hours, and (⊛) 48 hours.

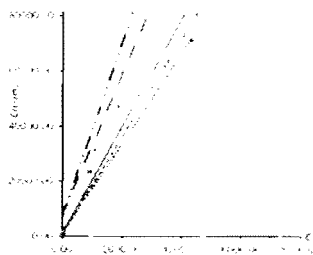


Figure 2. Curve of Isotherm Langmuir of HDTMA on zeolite in different contact time (—) 24 h, (—) 30 h, (.....) 42 h, (— · —) 45 h, and (—) 48 h.

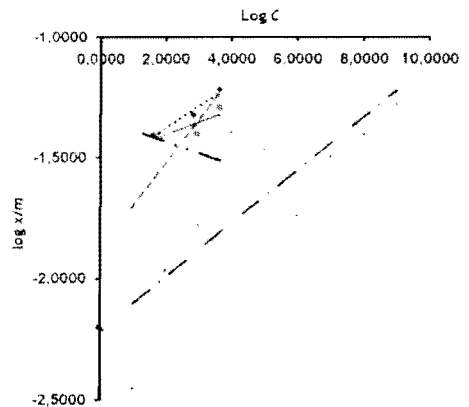


Figure 3. Curve of Isotherm Freundlich adsorption of HDTMA on zeolite at different contact time (—) 24 h, (—) 30 h, (.....) 42 h, (— · —) 45 h, and (—) 48 h.

Isotherm adsorption of HDTMABr on zeolite was analyzed with Langmuir and Freundlich isotherm pattern (Figure 2 and 3, respectively). The five different contact time on isotherm adsorption showed that the high linearity found in Langmuir isotherm (r : 0.7439, 0.6935, 0.998, 0.9964, 0.9959 compared to 0.3062, 0.0403, 0.9614, 0.8704 and 0.5894 on Freundlich isotherm).

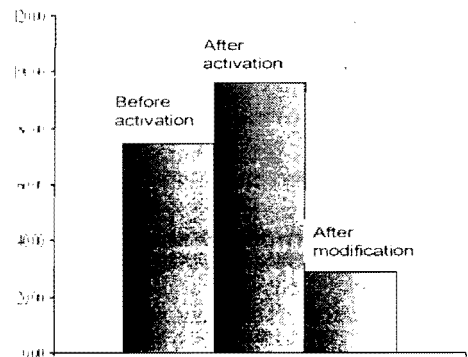


Figure 4. Cation Exchange Capacity of Zeolite

Cation exchange capacity (CEC) of initial zeolite is about 74.81 meq/100 g (Figure 4). The CEC was increased up to 96.24 meq/100 g zeolite after activation process with washing with acid. Washing with acid can remove the impurities in the pores of zeolite and turning them into H-zeolite without changing the position of the framework of silica-alumina.

CEC value decreased after modified zeolite with HDTMABr (20.76 meq/100 g zeolite). The decreasing CEC is happen because a number of

HDTMA⁺ ions formed in to bilayer with each other. This bilayer covered most of zeolite surface through ion exchange mechanism. The smaller CEC value of zeolite showed that this zeolite has ability to absorb ion.

Surface plot of capacity vs time and pH

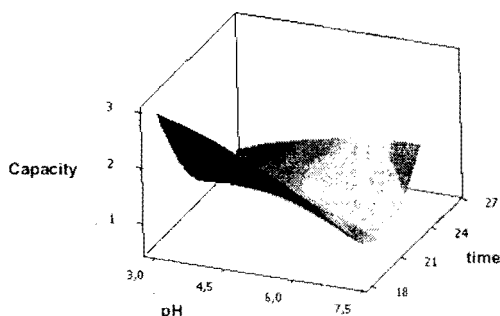


Figure 5. Response surface area interaction curve between capacity, pH, and contact time

Based on Figure 5, adsorption capacity of Cr(VI) is influenced by pH and contact time between Cr(VI) and adsorbent. From response surface data, the composite desirability value was about 1000, it means that the model used has the best accurate prediction. Based on the determination of optimum condition in response surface area the adsorption of Cr(VI) by zeolite modified by HDTMABr 1000 ppm has high capacity at pH 3 with contact time about 18 hours.

Adsorption of Cr(VI) by zeolite strongly influenced by pH of chromate solution used. According to Zeng et al (2009)[7], adsorption capacity of Cr(VI) decreases with increasing pH. The increasing adsorption capacity of Cr(VI) in acid may be due to the equilibrium of chromate and dichromate. Equilibrium reactions which occur are as follows:

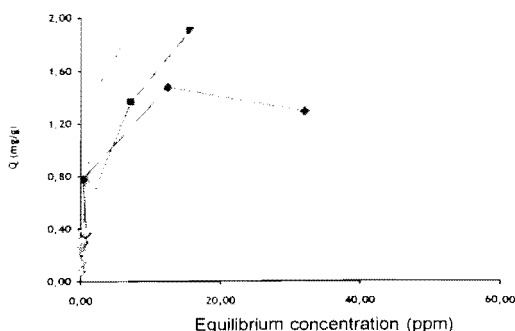
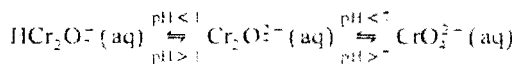


Figure 6. Adsorption capacity of Cr(VI) in 18 hours with variation pH (■) 3, (□) 4, (▲) 5, (◆) 6, and (●) 7.

Based on Figure 6, the optimum adsorption capacity produced at pH 3 with capacity about 1.90 mg/g. It means that 1 g of zeolite optimum to absorb Cr(VI) up to 1.9 mg. The comparison between adsorption capacity of Cr(VI) on zeolite with and without modification at Cr(VI) 60 ppm is shown in Figure 7. The highest adsorption on zeolite without modification is about 0.64 mg/g, while for modified zeolite up to 1.9 mg/g (increased about three times).

These results showed a significant increase capacity due to the insertion of cation HDTMA⁺ which form a bilayer on the surface of zeolite. It in turn alter the originally negative charged zeolite become positive, so that it can absorb the anion Cr(VI) with larger capacity than the unmodified zeolite. The formation of bilayer is formed through hydrophobic interaction between tails of HDTMABr [8 – 11].

Desorption of Cr(VI) were calculated using batch system using the same solution, namely a mixture of NaOH 0.5M and Na₂CO₃ 12.28M (1:1 v/v). Desorption with batch system is better than fixed bed method (Figure 7). This is because the batch method will contact strongly and continuously between adsorbent and Cr(VI).

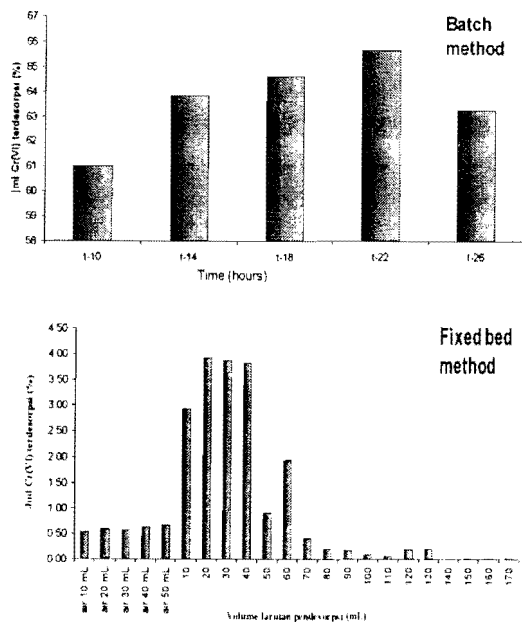


Figure 7. Desorption of zeolite and contact time for batch method and fixed bed method

Figure 7 showed that desorption process in batch method obtained the best contact time for 22 hours with the amount of Cr(VI) about 65.67%. The optimum desorption of Cr(VI) in fixed bed method up to 3.93%.

Characteristics in IR which can distinguish between natural zeolite with modified zeolite was seen in 2927.65 cm^{-1} (area for $-\text{N}(\text{CH}_3)_2$) which comes from HDTMABr. In addition, the stretch peak 2856.33 cm^{-1} is related to $\text{CH}_3\text{-R}$, while in region $3000 - 3500\text{ cm}^{-1}$ is related to $\text{CH}_3\text{-R}$ asymmetry. According to Li & Gallus (2007), the peak appears on 2860 and 2930 cm^{-1} is generated by the monomers and micelles of HDTMA⁺ [12].

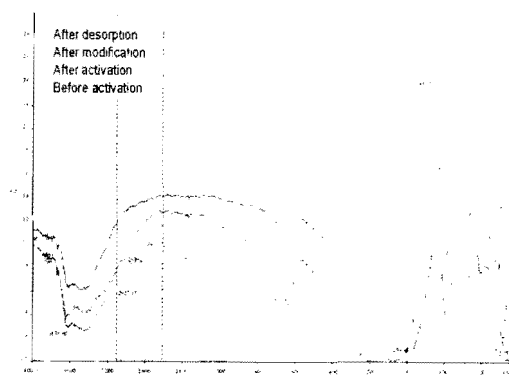


Figure 8. IR Spectrum of zeolite

Based on IR analysis (Figure 8), the zeolite after desorption indicated that leaching solution did not eliminate the HDTMA⁺ component. Zeolite still shows absorption bands at 2856.33 cm^{-1} , although with very low intensity.

4. Conclusion

Modification of zeolite with HDTMABr could be used as solid phase extraction of Cr(VI) with adsorption capacity about 1.90 mg/g in optimum condition. It gave higher adsorption level than zeolite without modification. NaOH 0.5M mixed with $\text{Na}_2\text{CO}_3\text{ }0.28\text{M}$ in ratio $1:1\text{ (v/v)}$ is used as solution for desorption of Cr(VI) in batch system with 65.67% of Cr(VI) could be removed from the modified zeolite.

5. References

- [1]. Gang D, Banerji S.K., Clevenger T.E., (1999), Chromium (VI) removal by modified PVP-coated silica gel. Proceeding of the 1999 Conference on Hazardous Waste Research, Missouri, Columbia 64-67.
- [2]. Trisunaryanti W, Triwahyuni E, Sudiono S., (2005), Preparasi, modifikasi, dan karakterisasi katalis Ni-Mo/ zeolit alam dan Mo-Ni/ zeolit alam. *Teknoin* 10 (4):269-282.
- [3]. Zang P, Avudzeaga M, Bowman R.S., (2007), Removal of perchlorate from contaminated waters using surfactant-modified zeolite. *Journal of Environmental Quality* 1069-1075.
- [4]. Ghiaci M, Kia A, Abbaspur A, Azad F.S., (2004), Adsorption of chromate by surfactant modified zeolites and MCM-41 molecular sieve. *Separation and Purification Technology* 40:285-295.
- [5]. Klute A., (1986), Methods of Soil Analysis Part I: Physical and Mineralogical Methods. Second Edition. Wisconsin: United States of Agronomy and Soil Science Society of America.
- [6]. Cleseeri L.S., Greenberg A.E., Eaton A.D., Rice E.W., (2005). Standard Methods for the Examination of Water and Wastewater. 21th Edition. Washington DC: American Public Health Association.
- [7]. Zeng Y, Woo Heesoo, Lee Gwanhun, Park Junbom (2009), Adsorption of Cr(VI) on hexadecylpyridinium bromide (HDPB) modified natural zeolites. *Microporous and Mesoporous*
- [8]. Chutia P, Kato S, Kojima T, Satokawa S., (2009), Adsorption of As(V) on surfactant modified natural zeolites. *Journal of Hazardous Material* 162: 204-211.

- [9]. Cordoves P, Valde's MG, Fernandez JCT, Luis GP, Calzo JAG, Garcia MED., (2008), Characterization of the binding site affinity distribution of surfactant modified clinoptilolite. *Microporous and Mesoporous Materials* 109: 38–48.
- [10]. Bowman RS, Zhang Pengfei, Xian Tao, Johnson RL, Johnson TL., (2000), Surface-altered zeolites as permeable barriers for *In situ* treatment of contaminated groundwater. (Research report). Daytona: National Energy Technology Laboratory.
- [11]. Madjan M, Pikus S, Rzaczyn Z, Iwan M, Maryuk O, Kwiatkowski R, Skrzypek H., (2006), Characteristics of chabazite modified by hexadecyltrimethylammonium. *Journal of Molecular Structure* 791: 53–60.
- [12]. Li Z, Gallus L., (2007), Adsorption of dodecyltrimethylammonium and hexadecyltrimethylammonium onto kaolinite-competitive adsorption and chain length effect. *Applied Clay Science* 35: 250-257.