

SINTESIS LEMPUNG TERPILAR SiO₂/Ni DARI LEMPUNG ALAM DAN PEMANFAATANNYA SEBAGAI KATALIS OKSIDASI FENOL DALAM AIR LIMBAH

Oleh :
Pulojuhadi Nababan
J2C 002 158

RINGKASAN

Limbah fenol dapat mencemari lingkungan, namun pengolahan limbah fenol masih memiliki banyak kendala. Kendala disebabkan proses pengolahan yang menggunakan prinsip *flokulasi* dan *koagulasi* dengan biaya instalasi dan operasional yang mahal. Menanggapi kendala tersebut lempung terpillar SiO₂ mampu digunakan sebagai katalis oksidasi fenol dalam air limbah.

Lempung terpillar SiO₂ memiliki *basal spacing*, luas permukaan besar, dan stabil pada temperatur tinggi. Sintesis lempung terpillar SiO₂ melalui proses interkalasi TEOS (tetraetilortosilikat) dan surfaktan dodesilamin pada daerah antarlapis lempung. Lempung terpillar SiO₂ diimpregnasi dengan menggunakan logam nikel. Proses sintesis lempung terpillar SiO₂ dikarakterisasi menggunakan metode difraktometer sinar X dalam menentukan kenaikan *basal spacing* dan kristalinitas. Penentuan aktivitas katalis lempung terpillar SiO₂/Ni terhadap konversi oksidasi fenol dalam air limbah menggunakan spektrofotometri UV-Visible.

Lempung terpillar tanpa kalsinasi menghasilkan *basal spacing* 28.55 Å sedangkan lempung terpillar SiO₂ kalsinasi 600 °C menghasilkan *basal spacing* 27.77 Å. Aplikasi lempung terpillar SiO₂/Ni sebagai katalis oksidasi fenol dalam air limbah mampu mengkonversi limbah fenol hingga mencapai 80 %. Semakin banyak nikel yang terlemban ada lempung terpillar SiO₂ maka aktivitas katalisisnya semakin meningkat.

SUMMARY

Phenol waste can pollute the environment, but waste manufacture still have many problems. It cause by manufacturing process that use flocculation and coagulation principle with spend installation and operational cost expensively. There so to handle that problems, SiO₂ pillared clay can be used as catalyst the oxydation of phenol in the wasted water.

SiO₂ Pillared clay have basal spacing, huge surface area, and stabilize to high temperature. Synthesis of SiO₂ pillared clay are through intercalation TEOS (tetraethylorthosilicate) and surfactant dodecylamine processes at interlayer clay area. SiO₂ pillared clay impregnated by nikel metal. Synthesis of SiO₂ pillared clay process charachterized with an X-ray diffractometer method in used for basal spacing increase and crystallination. Formulation of SiO₂/Ni pillared clay catalyst activity for the oxidation of phenol solution conversion in the wasted water are using spectrofotometric UV-Visible.

Pillared clay without calcination produce basal spacing 28,55 A, different than SiO₂ pillared clay calcination at 600 OC temperature produce basal spacing 27,77 A. SiO₂/Ni pillared clay application as catalyst the oxidation of phenol in the wasted water can convert phenol waste until 80 %. Which mean that more nikel concentration were inserted into SiO₂ pillared clay would be increasing catalyst activity.

DAFTAR PUSTAKA

- Adiwisastra, 1978., Metode pengolahan limbah phenol dalam perairan, Lembaga ilmu pengetahuan indonesia, *Jurnal ilmiah Lipi Polimer*, PuspiTek, vol. 54/120, no. 03-35, Serpong, Tangerang 23, 2563
- Erno E. Kiss., Jonjaua G. Ranogajec., Radmila P. Marincovic-nedicin., Tatjana J. Vulic., 2004., Catalytic wet peroxide oxidation of phenol over AlFe pillared montmorillonite., Univesity of Novi Sad, Faculty of Technologi., *React. Kinet. Catal. Less.*, vol. 80, no. 2, 255-260., Serbia and Montenegro
- Erno E. Kiss., Matilda M. Lazic., Goran C. Boskovic., 2003., AlFe pillared clay catalyst for phenol oxidations in aqueous solution, Univesity of Novi Sad, Faculty of Technologi., *React. Kinet. Catal. Less.*, vol. 83, no.2, 221-227., Serbia and Montenegro
- Ettinger M. B., Ruchhof C. C., and Lishka R. J., 1970., *Sensitive 4-aminoantipirin for phenolic compound*, Analytical Chemistry, 23, 1978 Figueras, F., 1996., Pillared clay as catalyst, *Catalyst. Rev. Sci. Eng. Chem. matter*, 3, 20053, 457-499
- Gales, M. E., and Booth, R. L., 1976., *Automated 4-AAP phenolic method*, AWWA Gozan, M. Slamet., 2001., Aktivasi, karakterisasi, preparasi, dan uji aktivitas lempung terpillar SiO₂/Ni, AlPO₄, Al₃Ti, dan TiO₂ aplikasi katalis reaksi reformasi gas CO₂, Departemen Teknik Gas dan Petrokimia, Fakultas Teknik Universitas Indonesia, *tidak dipublikasikan*, Depok 2, 16424, 442-524
- Hanaoka, K. Nakajima., Y. Sugi, T. Matsuzaki., Y. Kubota, S. Tawada., and A. Ingarashi l., 1997., Effect of SiO₂/Al₂O₃ ratio of H⁺-mordenite on encapsulated product inside the pores in shape-selective isopropylation of biphenyl, National Institute of Materials and Chemical Research, AIST., Institute of Material Science, University of Tsukuba, *Catalyst Letter.*, Japan 50/1998, 149-152
- Han, Yang-Su., Matsumoto, Hideya., Yamanaka, Shoji., 1997., Preparations of new silica sol based pillared clay with high surface area, and high thermal stability, *Eng. Chem. Matter.*, Korea 12, 2013-2018
- Kwon, Oh-Yun Shin., Hak-sik, Choi., Sang-Won., 2000., Preparations of porous silica pillared layared phase; Simultaneous intercalations bilayer of amine tetraethylorthosilicate into the H⁺-maganidi and intragallery amine catalyzed hydrolysis of tetraethylorthosilicate, Korean Research Institute of Chemical Thecnology, *Korean Chem. Matter.*, Korea 12, 1273-1278
- Ohtsuka. K., 1997., Preparations and properties of two dimensional microporous pillared interlayered solids, *Chem. Matter.*, Japan 9, 2039-2052

- Pinnavaia dan Poleverjan, 1997., Intercalated clay catalysts, Department of Chemistry and Center For Fundamental Materials Research., Michigan State University, East Lansing, *Chem. Matter* 13, 37603765, Michigan 48824
- Tan, K. H., 1991., *Dasar-dasar kimia tanah*, a. b ; Goenadi, D. H., edisi pertama, UGM press, Universitas Gadjah Mada, Yogyakarta
- Theng, B. K. G., 1974., Nature of carbonaceous deposit on the alumina supported transition metal oxide catalyst in the wet air oxidation of phenol., Department Of Chemical Engineering, National Research Laboratory for Environmental Catalyst, *Chem. Eng. Catal. Sci* Daejeon 305-701, Korea
- Takayoshi Sasaki, Fathy Kholi., and Mamoru watanabe., 1998., A new pillared structure with double-layer of alumina, National Institute for Research Inorganic Materials., University of Tsukuba, *Catalyst Letters.*, Japan 305-0044
- Vansant, E. F., Cool, P., 1997., Pillared clay; Preparations, characterizations, and applications, *Catalyst. Rev. Sci. Eng. Chem. Materials*, vol. 33. 265-285
- Warlina R., 1985., Removal treatment detoxifications of toxic aqueous solutions, geological material chem letters online, Heavy metal in the environment part I; Cycling and characterizations., Springer-Verlags, *Organometal Catalyst Letters*, Publishing akatsuka., Tokyo, Japan (1995), pp. 193-207