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Catalytic Performance of Al-HDTMA Bentonite Impregnated Fe on Phenol Hydroxylation

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ABSTRACT

This paper describes the addition of Fe into modified-bentonite layer by impregnation method. Natural bentonite (from Pacitan, Indonesia) was intercalated with HDTMA-Br 1,5 % solution before pillared with Al metal to give Al-HDTMA bentonite forms. The ratio of bentonite and intercalating agent or pillaring agent was 1 gr/50 ml. The mixture was agitated, and then the solid phase was washed with distilled water. Then it was dried and calcined at 723 K for 4 hours. This modified bentonite was then impregnated with Fe solution. The Fe concentrations were 0.01 M, 0.05 M, and 0.1 M. All the materials were characterized using FT-IR and X-ray diffraction. X-ray diffractogram showed that the higher Fe penetrates into bentonite, the lower the crystallinity of bentonite. Their catalytic activity and selectivity were studied for phenol hydroxylation using H_2O_2 (30%). The reaction conditions of this reaction were as follows: ratio of phenol/ H_2O_2 = 1:1 (molar ratio), concentration of phenol = 1 M, reaction temperatures were 333 K, and ratio of catalyst/phenol was 1:10. The best catalytic performance to convert phenol and produce hydroquinone by phenol hydroxylation reaction is on PILB HDTMA-Al,Fe 0.05 M.

Keywords: bentonite, impregnation, catalyst, phenol hydroylation

INTRODUCTION

Clay is one of the most abundant material found in nature. Bentonite, the material which is used in this research, is natural bentonite from Tulakan, Pacitan in east Java. Bentonite consists of montmorillonite mineral as the major component. Up to now, bentonite can be utilized as filler, ion exchanger, catalyst, adsorbent etc.