Octyl Phenol Synthesis Using Natural Clays

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Abstract: A series of clay minerals, HB, NB and Al-PILC have been studied in the alkylation reactions of 2-octanol with phenol at 180°C, under conditions of alcohol/phenol = 1 (mole ratio) and W/F_A^{o} = 64,27 $ghmol^{-1}$. The selectivity of Al-PILC was 77,12% for octyl phenol and 16,5% for dioctyl phenol.

Introduction

The aromatic alkylation is an interesting industrial reaction catalyzed by acids. Octylphenoles, can be obtained by alkylation of phenol with the corresponding olefin or alcohol. These chemicals are used as surfactants.

Generally these products are synthesized using catalysts such as: sulphuric acid, boron trifluoride, hydrofluoric acid and phosphoric acid, with all the involved environmental pollution problems.

In this paper are shown the results obtained when the traditional catalysts are replaced by a heterogeneous acid catalysts, obtained from natural clays, in order to decrease the environmental pollution.

Experimental

The catalysts were prepared starting from a natural bentonite, NB, and HB means a bentonite treated with hydrochloric acid according to [1], AL-PILC 10 to a bentonite pillared with an oligomer of Al (10 mmoles Al/g of bentonite) according to [2]. The catalysts were characterized by surface areas: NB=44 m^2/g; HB=64 m^2/g and AL-PILC=211 m^2/g.

The reactions were carried out at room pressure in a fixed bed reactor, using 0,5 g of catalysts under isothermic conditions, a mixture of phenol (Merck, 99.3%) and 2-octanol (molecular rate 1/1) was injected, preheated and diluted with a flow of dry nitrogen; the products and unreacted reagents were collected at 273°K and analyzed by GLC using a column of OV-101 (10%). The reaction products were identified by GC- mass, FT-IR and ^1H NMR. The conversion and selectivities are in moles per cent.

Results and Discussion

Phenol conversion and products selectivity at time on strem 2 hours, are shown in the next table.

CATALYSTS	PHENOL CONVERSION	SELECTIVITY			
		Alkylphenol	Dialkylphe-nol	Trialkylphe-nol	Ether
NB	4.48	56.93	2.38	0	40.68
HB	29.92	63.42	28.83	6.33	0
Al-PILC 10	35.50	77.12	16.65	5.97	0.25

We can observe that the increase in conversion correlates with the acidity of the solids; NB show a low acidity owing to terminal silanole groups. The acid treatment and the pillaring increase the acidity, the phenol conversion and the selectivity to the alkylation products.

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References and Notes

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