

DIMERS OF METHYL ESTERS OF RAPESEED OIL FATTY ACIDS

B. CHMIELARZ, Z. KLUKOWSKA - MAJEWSKA

Industrial Chemistry Research Institute, 01-793 Warszawa,
Poland

ABSTRACT

Dimers produced from fatty acids and their esters have many applications in technics, but mostly they are used in the manufacture of polyamide resins. The methods of manufacturing of dimers from the domestic fatty raw materials were studied.

INTRODUCTION

The biggest part in the production of dimers of fatty acids are the dimers obtained from tall oil acids and oleic acid. Also rapeseed oil can be the raw material for manufacturing of dimers, especially of the ester type.

The most frequently used method of the manufacturing of dimers is the method with use of elevated pressure and activated montmorillonite as catalyst.

The methods of manufacturing of dimers of fatty acids methyl esters by processes realized under elevated and atmospheric pressure were elaborated.

In the process realized under elevated pressure montmorillonite activated with acids was used as catalyst.

In the process realized under the atmospheric pressure organic and inorganic complexes of boron fluoride were used as catalysts.

EXPERIMENTAL

Dimerization under elevated pressure

Table 1 shows the yield of dimers of methyl esters of low erucic rapeseed oil fatty acids obtained with use of montmorillonite activated with different acids. The best result was obtained for activation with phosphoric acid.

TABLE 1. Dimerization of methyl esters of low erucic rapeseed oil fatty acids with montmorillonite catalyst. Constant parameters: temperature 240°C, time 4 hrs

Catalyst quantity	Activator	Pressure of N	Yield of dimers
wt. %		atm	wt. %
8,0	HCl	8	41,6
4,0	H ₃ PO ₄	17	47,4
8,0	H ₃ PO ₄	8	56,3
8,0	H ₃ PO ₄	18	64,8
8,0	CH ₃ COOH	17	57,4
8,0	CH ₃ CH ₂ COOH	18	57,9
8,0	CH ₃ C ₆ H ₄ SO ₃ H	19	58,5

Dimerization under atmospheric pressure

Table 2 shows the yield of dimers of methyl esters of low erucic rapeseed oil fatty acids obtained with use of boron fluoride complexes as catalysts. The best yield of dimers was achieved with use of complexes with acetic acid anhydride and phosphoric acid (74,0 and 67,0%), with another complexes the yields achieved about 50%.

TABLE 2. Dimerization of methyl esters of low erucic rapeseed oil fatty acids with boron fluoride complexes. Constant parameters: temperature 160°C, time 4 hrs

Complex	Wt.%, of BF ₃	Yield of dimers
BF ₃ (CH ₃ CO) ₂ O	1,0	43,9
BF ₃ H ₃ PO ₄	1,0	35,3
BF ₃ · 2 CH ₃ COOH	1,0	57,0
BF ₃ · C ₆ H ₅ OH	1,0	46,7
BF ₃ · (CH ₃ CO) ₂ O	2,0	74,0
BF ₃ · H ₃ PO ₄	2,0	51,0
BF ₃ · 2 CH ₃ COOH	2,0	65,2
BF ₃ · C ₆ H ₅ OH	2,0	62,5

The best yield obtained for dimers of methyl esters of high erucic rapeseed oil fatty acids was ca. 40 wt.%. The unreacted monomers were separated by distillation on vacuum thin evaporator. The obtained dimers contained min. 85,0 wt.% of main constituent and up to 10 wt.% of monomers.

Dimers were analysed by gel chromatography method.