

DECOMPOSITION AND DEOXYGENATION OF LIGNIN IN TWO STEPS OVER ACID AND DIFUNCTIONAL CATALYSTS

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Lignin is by-product created during explosive decomposition of phyto- and ligno-mass to main products – cellulose and hemicellulose, that are converted by fermentation to bioalcohol. Lignin is a heterogenous crosslinked amorphous polymer produced during biosynthesis process within the plant by radical polymerization of p-coumaryl, coniferyl and sinapyl alcohols. Lignin side stream can be burned in fluid bed boiler where the heat energy is released in form of steam that represents a source of heat and subsequently also the electricity. Another, more valuable option of lignin utilization is catalytic conversion into a bio-aromatic hydrocarbons mixture, bio-phenols or the high-octane components of gasoline. Acid and difunctional catalysts based on metals/zeolites (Y, ZSM-5, SAPO, MCM-41, SBA-15) and hydrotalcites are the most tested heterogeneous catalysts for the decomposition of lignin. The products of catalytic decomposition have to be deoxygenated and partially hydrogenated. For this purposes, bifunctional catalysts based on metals/zeolites, hydrotalcites or alumina are used.

In this work, different combination of acid and difunctional catalysts were tested in autoclaves at 350 °C and 5 MPa of autogenous pressure for decomposition of lignine at 360 °C and 5 MPa of hydrogen in following deoxygenation step. Products were analyzed by GC-MS.

Examples of product compositions are in following Table:

Depolymerisation	Ni-Cu/Sapo11	NiMo/Al₂O₃	Clinoptilolit acid treated
Hydrodeoxygenation	NiMo/Al₂O₃	NiMo/Al₂O₃	Cu/USY
alkanes	5.62	6.96	2.5
aromatics	57.29	57.38	84.49
cyclanes	32.39	31.45	0.52
cyclenes	0.49	0.59	0.31
cyclodiens	0.25	0.37	0
alkenes	0.74	0.88	0
phenol	0.35	1.28	1.66
metoxyphenols	0	0	0.12
indanes	0	0	0.36
indenes	0	0	2.19
furanes	0	0	6.37

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