P-17: Ultrasonic treatment of homogeneous catalyst for cyclohexane oxidation

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Research of different nature homogeneous catalysts for the cyclohexane (CYH) oxidation to cyclohexanol (COL) and cyclohexanone (CON) showed prospects of studies of individual catalysts which have innercomplex compounds properties (Reutskyy et al, 2010). The influence of cobalt salt of 2-(heptadecanoicammonic) pentandioic acid (CoS, Figure 1) in the liquid phase cyclohexane oxidation process was researched.

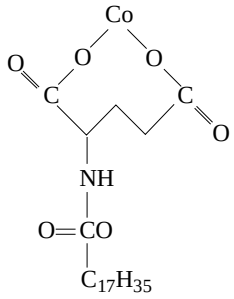

Figure 1: Cobalt salt of 2-(heptadecanoicammonic) pentandioic acid (CoS).

Efficiency of ultrasound in the process of oxidation of cyclohexane was researched erlier (Ivashchuk and Reutskyy, 2008). Influence of previous ultrasonic treatment (UT) of CoS in cyclohexane at main indicators of CYH oxidation was researched. Ultrasonic treatment was performed for 5 min with a frequency υ=22 kHz. Experimental data were compared with results obtained using industrial catalyst – cobalt naphthenate (CoNph). The research results at the industrial conversion values (X≈4%) are presented in Table 1.

Table 1

The influence of homogeneous catalysts at cyclohexane oxidation process. T=145°C, X≈4%, P=1,0 MPa, Ccat = $5{,}0\times10^{-4}$ mol/l).

№	Catalyst	C_{cat}, mol/l	X, %	S(CHP[1]), %	S(A[2]), %	S(ET[3]), %	S(COL), %	S(CON), %	S(AP[4]), %	C(COL)/C(CON)
1	CoNph	5×10^{-4}	4,1	2,03	6,94	18,31	42,36	30,36	80,85	1,39
2	CoS	5×10^{-4}	4,7	1,55	1,92	5,81	50,09	40,64	94,21	1,23
3	CoS+UT	5×10^{-4}	4,3	5,54	5,66	0,00	45,54	43,25	94,34	1,05

Note: [1] cyclohexyl hydroperoxide; [2] acids, [3] ethers, [4] aim (base) products

Experimental data showed the efficiency of the catalyst CoS and its previous ultrasonic treatment for cyclohexane oxidation process. Ultrasound treatment increases efficiency of catalyst CoS – it further shifts value of aim products toward the accumulation of CON in the reaction environment. Also, ultrasound allows slightly increase the overall selectivity of aim products of the process.

Reference

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Ivashchuk O.S. and Reutskyy V.V., 2008, Program and book of abstract of 11th Meeting of the European Society of Sonochemistry, La Grande-Motte, France, 191.