

The results of the experiments presented in figure 7.3 indicate very strong influence of the stirrer speed on the final selectivity for Reynolds numbers ranging from 3 to 24. In the case of the lowest agitation speed (50rev/min) the selectivity exceeds 0.4; notice that the upper limit for the selectivity equals 0.5. When the agitation speed is increased 8 times the final selectivity drops 2.6 times to 0.154.

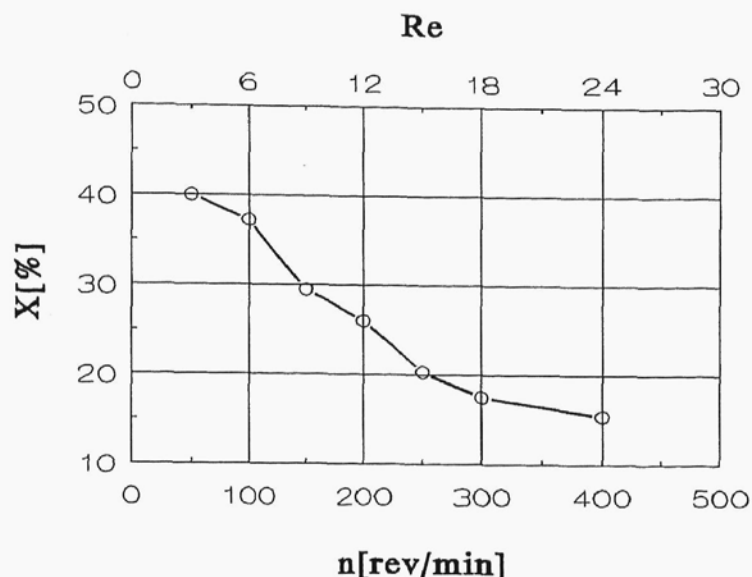


Figure 7.3. Effect of the stirrer speed on the final selectivity in the semi-batch reactor - experimental data.

7.2.3. Effect of the Initial Volume Ratio on the Product Distribution.

In the fourth and fifth series of experiments the effect of the initial volume ratio was studied for two revolution speeds of the pitched-blade turbine 100 and 400 rev/min. In all the experiments the feeding rate of the base solution was equal to 1 cm³/min.

Tables 7.IVabc report compositions, volumes, viscosities and densities of solutions and final selectivities obtained in these experiments. The plot of the final selectivity versus volume ratio is shown in figure 7.4. This plot includes two points obtained for 100 and 400 rev/min when a was equal to 19 (exp.no.2 in tables 7.I and exp.no.1 in tables 7.II).

Table 7.IVa. Forth and fifth series of tests - initial reactor content; $w_p=40$ %.

Exp.no.	HCl [mol/dm ³]	Ester [mol/dm ³]	V [cm ³]	ρ [g/cm ³]	μ [Pa·s]	KCl [g/kg]
1	0.01070	0.01031	675.42	1.0671	0.312	9.812
2	0.01058	0.01044	667.21	1.0660	0.309	7.588
3	0.01129	0.01102	651.27	1.0639	0.308	4.934
4	0.01070	0.01031	675.42	1.0671	0.312	9.812
5	0.01058	0.01044	667.21	1.0660	0.309	7.588
6	0.01160	0.01109	651.21	1.0638	0.308	5.000

Table 7.IVb. Fourth and fifth series of tests - feeding solutions; $w_p=40\%$.

Exp.no.	NaOH [mol/dm ³]	V [cm ³]	ρ [g/cm ³]	μ [Pa·s]
1	0.1589	45.02	1.0674	0.331
2	0.1189	60.70	1.0662	0.328
3	0.07962	93.05	1.0642	0.320
4	0.1589	45.02	1.0674	0.331
5	0.1189	60.70	1.0662	0.328
6	0.08021	93.05	1.0638	0.322

Table 7.IVc. Fourth and fifth series of tests - final solutions; $Q_f=1\text{cm}^3/\text{min}$.

Exp. no.	n [rev/min]	Ester [mol/dm ³]	X [%]	V [cm ³]	ρ [g/cm ³]	μ [Pa·s]
1	100	0.006134	35.57	720.58	1.0669	0.313
2	100	0.006210	33.87	728.11	1.0657	0.310
3	100	0.006897	27.55	744.21	1.0641	0.312
4	400	0.008396	12.79	720.58	1.0669	0.313
5	400	0.008560	10.15	728.11	1.0657	0.310
6	400	0.008842	8.61	744.40	1.0636	0.312

The results confirm that decreasing the volume ratio, while keeping the average initial concentrations of the reactants constant, lowers the final selectivity. Changing volume ratio from 19 to 7 decreases the final selectivity 26% for the slower agitation speed, whereas for the faster agitation speed this fall is close to 44%.

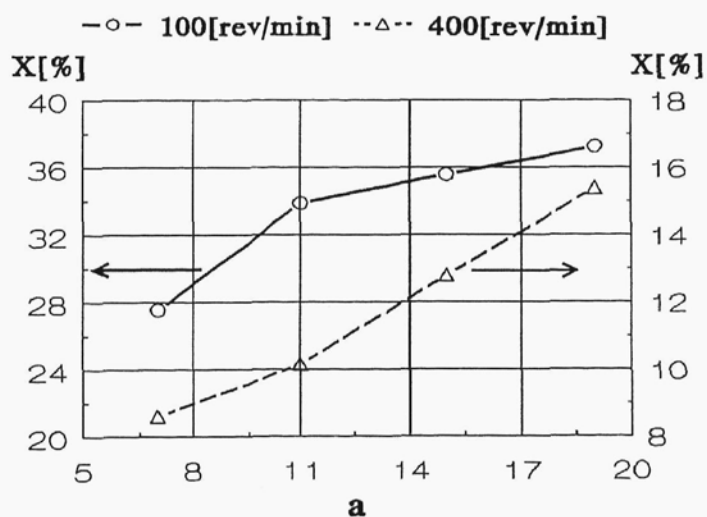


Figure 7.4. Effect of the initial volume ratio on the final selectivity in the semi-batch reactor - experimental data.