MATHEMATICAL MODELING OF THE RESULTS OF THE PROCESS OF OBTAINING ARENES IN THE EXTRACTION

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Abstract: The article describes of the chemical and oil and gas industry, the processing of various organic wastes, and the localization of products are urgent issues.
Keywords. benzene, xylene, toluene, extraction, aromatic hydrocarbons, mathematical modeling, kinetic parameters.

Currently, the development of the chemical and oil and gas industry, the processing of various organic wastes, and the localization of products are urgent issues. As we all know, during the extraction of various organic substances, including aromatic hydrocarbons, benzene, xylene, and toluene from the composition of oil products, they can be widely used in various fields of industry. The study of the composition of liquid products of the pyrolysis process of JV "Uz-Kor Gas Chemical" JV, and the extraction of aromatic hydrocarbons from them was carried out in the thesis work.

It should be noted that it expands the scope of use of aromatic compounds and their derivatives isolated by the extraction method and leads to a decrease in the volume of imports. Mathematical modeling of the processes involved in the extraction of aromatic hydrocarbons allows to determine the optimal technological parameters for the extraction of pure compounds. Mathematical modeling of experimental results was carried out using the method of least squares. The correlation status of the experimental results is presented in Table 1 [1].

Table 1

x	x_1	x_2	x_3	…	x_{n-1}	x_n
y	y_1	y_2	y_3	…	y_{n-1}	y_n

An analytical relationship was created to explain the experimental results. The least squares method $f(x, a_1, a_2, \dots, a_k)$ was used to create these parameters. In this process, the function $f(x, a_1, a_2, \dots, a_k)$ obtained squares of the result u, f displacements in units of size $Y_i = f(x, a_1, a_2, \dots, a_k)$ was taken into account to be less than the dimensions of displacement in .

$$S(a_1, a_2, \dots, a_k) = \sum_{i=1}^{n} [y_i - Y_i]^2 = \sum_{i=1}^{n} [y_i - f(x, a_1, a_2, \dots, a_k)]^2 \to min \quad (1$$

Figure 1. Analytical dependence of yield on temperature

Modeling of the process was carried out in two stages based on literature sources:

1. In the modeling, the external appearance of the connection selected according to the experimental results was determined.

2. $Y = f(x, a_1, a_2, \dots, a_k)$ the dependence coefficient was selected in the function and this dependence was calculated by a_i in the first function.

3. $S(a_1, a_2, \dots, a_k)$ (1) the minimum sufficient condition of the function was equal to zero in all its derivatives. The following equation was used to find the minimum function in the process.

If the parameters a_i are linear with dependence in the function $Y = f(x, a_1, a_2, \dots, a_k)$, we get the following system (3) from k linear equations with k unknowns.

When calculating the parameters, $a_i$in the system of equations is numerous and takes the form $Y = \sum_{i=1}^{k} a_i x^{i-1}$ in the k-1-level and is represented by the following system:
Then system (4) is written in matrix form
C matrix and g vector elements were calculated by this formula.
From the system (4) above, the dependence parameters $Y = a_1 + a_2 x + a_3 x^2 + \dots + a_{k+1} x^k$ are determined.

The results of extraction process of aromatic compounds benzene, toluene and xylene extracted from petroleum products were mathematically modeled. In order to determine the kinetic parameters, the process speed was calculated based on the following table.

A mathematical model for this process and an analytical function for each case were created, and the mathematical model of this reaction was explained based on the following table.

Table :

t_i	25	30	35	40
u_i	12,2	16,7	18,2	16,4

Here t_i is the temperature, u_i is the product yield.

$$S(a_1, a_2, \dots, a_k) = \sum_{i=1}^{4} [u_i - U_i]^2 = \sum_{i=1}^{4} [u_i - f(t_i, a_1, a_2, a_3, a_4)]^2 \to min$$

$$f(t_i, a_1, a_2, a_3, a_4) = a_1 + a_2 t_i + a_3 {t_i}^2 + a_4 {t_i}^3$$

First, the temperature at which the extraction process was carried out and its dependence on the product yield were modeled. A system of linear equations is created using the given values and function. We solve the system of linear equations (A, V, S) using the matrix method [2].

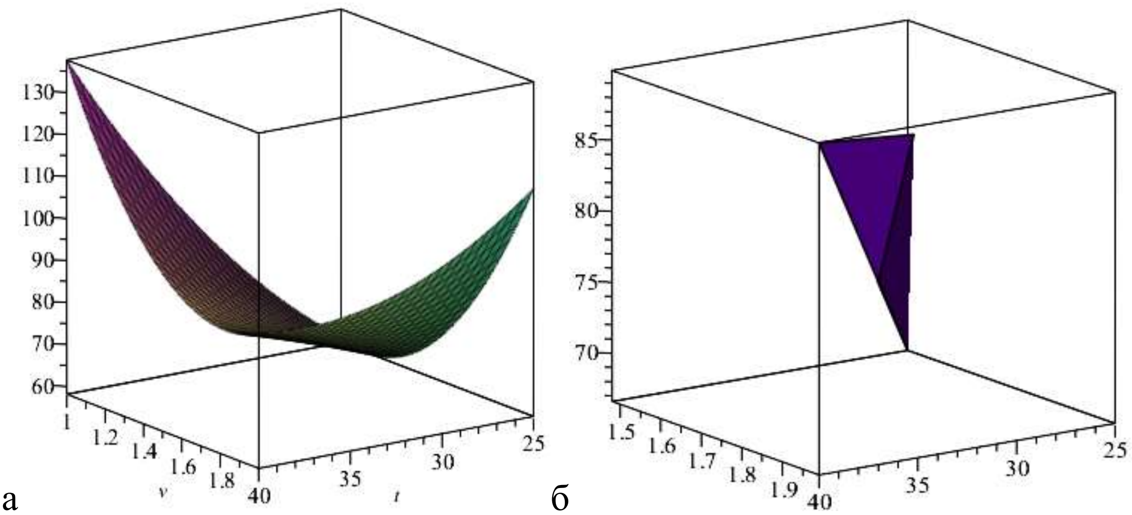
t[1] := 25; t[2] := 30; t[3] := 35; t[4] := 45

y[1] := 66.6; y[2] := 74.3; y[3] := 89.2; y[4] := 89.9

A matrix was created based on the results.

A Matrix

The given system of linear equations is formed. Based on the system of linear equations, the value of the (K, L, U) matrices is calculated according to the reaction rate. v[1] := 1.48; v[2] := 1.65; v[3] := 1.98; v[4] := 1.99



a б

Iconogram of effect of temperature and duration of reaction on yield (a)-experiment (b)-mathematical modeling.

The calculations showed that the experimental results show a 90% accuracy when mathematically processed.

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