For two sets of reactions without autocatalysis with different buffer steps

\[ 2Z \rightleftharpoons 2X, \quad Z \rightleftharpoons Y, \quad X+Y \rightleftharpoons 2Z, \quad X \rightleftharpoons S, \quad (Z \rightleftharpoons S) \]

and

\[ Z \rightleftharpoons X, \quad X \rightleftharpoons Y, \quad 2X+Y \rightarrow 3Z, \quad Z \rightleftharpoons S \quad (X \rightleftharpoons S) \]

a parametric analysis of the steady states has been carried out [1]. The influence of the type of buffer step on the conditions for self-oscillations are analyzed.

The kinetic model of a chemical reaction without autocatalysis, corresponding to the scheme

\[ 1) \quad 2Z \rightleftharpoons 2X, \quad 2) \quad Z \rightleftharpoons Y, \quad 3) \quad X+Y \rightarrow 2Z, \quad 4) \quad X \rightleftharpoons S \quad (1) \]

was analyzed previously [2]. The parametric dependencies are constructed, the bifurcation curves are written out explicitly for the various parametric planes, the regions, where self-oscillations exist, are singled out. Let us analyze the mechanisms differing from eqs 1 in the form of the fourth, buffer step.

**Buffer step \( Z \rightleftharpoons S \).**

The following conversion scheme

\[ 1) \quad 2Z \rightleftharpoons 2X, \quad 2) \quad Z \rightleftharpoons X, \quad 3) \quad X+Y \rightarrow 2Z, \quad 4) \quad Z \rightleftharpoons S \quad (2) \]
is considered. The corresponding kinetic model is of the form

\[ \begin{align*}
\dot{x} &= 2k_1 z^2 - k_3 xy - 2k_{-1} x^2 = P(x, y, s), \\
\dot{y} &= k_2 z - k_3 xy - k_{-2} y = Q(x, y, s), \\
\dot{z} &= k_4 z - k_{-4} s = R(x, y, s), \\
z &= 1-x-y-s.
\end{align*} \] (3)

The given model is analyzed in refs [3, 4]. Conditions for uniqueness and instability of the steady states are obtained. It is shown that kinetic model 3 can show 23 different types of dynamic behavior. In this study the parametric dependencies are constructed and the equations of the local bifurcations of steady states are written explicitly.

According to the scheme suggested in [13, to construct the parametric dependencies, one should write the system of three algebraic equations \( P = Q = R = 0 \) as one equation:

\[ \begin{align*}
2k_1 &\frac{k_2^2 (k_2 + k_3 x)^2 (1-x)^2}{(k_2 K + (1+K)(k_2 + k_3 x))^2} - k_3 x - k_4 K (1-x) \\
+2k_{-1} x^2 = 0
\end{align*} \] (4)

where \( K = k_{-4}/k_4 \), \( 0 \leq X \leq I \).

It is not difficult to obtain the expressions for rates \( k_i = \phi_i (x) \) [11] from eq. 4. To construct the boundary of the steady states multiplicity region \( L_\Delta \), let us add the following condition to eq. 4:

\[ \Delta (x, k_1, k_{-1}) = 0 \]

Thus, we obtain the parametric form of curve \( L_\Delta \)

\[ k_{-1}(x) = k_3 \frac{(2xy k_4 - k_{-4} (k_2 + k_3 x)) + zB}{4x (k_3 y (k_4 + k_{-4}) - k_{-4} (k_2 + k_3 x)) + Az} \]

\[ k_1(x, k_{-1}) = k_3 k_2 x (1-x) C + 2k_{-1} x^2 C^2 \]

\[ 2K^2 (1-x)^2 (k_2 + k_3 x)^2 \]

\[ \phi_1. \]