

Su, Juan; Xu, Bing; Zou, Lan**Bifurcation analysis of an enzyme-catalyzed reaction system with branched sink.** (English)

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Summary: In this paper, we study the local bifurcations of an enzyme-catalyzed reaction system with positive parameters α , β , γ and integer $n \geq 2$. This system is orbitally equivalent to a polynomial differential system with order $n+2$. Although not all coordinates of equilibria can be computed because of the high degree of polynomial, parameter conditions for the coexistence of equilibria and their qualitative properties are obtained. Furthermore, it is proved that this system has various bifurcations, including saddle-node bifurcation, transcritical bifurcation, pitchfork bifurcation and Hopf bifurcation. Based on Lyapunov quantities, the order of weak focus is proved to be at most 3. Furthermore, parameter conditions of the exact order of weak focus are obtained. Finally, numerical simulations are employed to illustrate our results.

MSC:

- 34C60 Qualitative investigation and simulation of ordinary differential equation models
- 34C23 Bifurcation theory for ordinary differential equations
- 92C45 Kinetics in biochemical problems (pharmacokinetics, enzyme kinetics, etc.)
- 34C05 Topological structure of integral curves, singular points, limit cycles of ordinary differential equations

Keywords:

enzyme-catalyzed reaction; saddle-node bifurcation; transcritical bifurcation; pitchfork bifurcation; Hopf bifurcation

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