具有时滞和可变营养消耗率的比率型Chemostat模型稳定性分析

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摘要   考虑了一类具有时滞和可变营养消耗率、增长函数为比率确定型的微生物连续培养模型. 首先,详细地讨论了解的存在性、有界性、平衡点的局部渐近稳定性以及Hopf分支. 其次, 利用 Lyapunov-LaSalle 不变性原理证明了边界平衡点的全局渐近性. 最后, 利用时滞微分系统解的极限集的一些性质, 证明了当正平衡点存在时,对任意时滞系统是一致持久的.

Stability Analysis of a Ratio-Dependent Chemostat Model with Variable Yield and Time Delay

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Abstract In this paper, based on some biological meanings, a class of ratio-dependent Chemostat model with variable yield and time delay is considered. In the Chemostat model, time delay is introduced into growth response of microbial population. Firstly, a detailed theoretical analysis about existence and boundedness of the solutions and local asymptotic stability of the equilibria are carried out, and the Hopf bifurcation is also studied. Then by using classical Lyapunov-LaSalle invariance principle, it is shown that the washout equilibrium (i.e., boundary equilibrium) is globally asymptotically stable for any time delay. Finally, it is shown that the Chemostat model is uniformly persistent for any time delay.

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