



Stability Conditions and Stability Boundaries of a SHARON Bioreactor Model with Multiple Equilibrium Points

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Received: December 10, 2005; Revised: May 25, 2006

Abstract: This paper addresses the dynamics of a SHARON bioreactor for ammonium removal from concentrated wastewater streams. It is shown that multiple equilibrium points occur for a simplified reactor model. Conditions are determined for which the system possesses multiple equilibrium points and the corresponding phase portraits are analysed. In case the reactor model possesses two locally asymptotically stable equilibrium points, the stability boundary, that separates their attraction regions, is visualized. Subsequently, it is examined how small parameter changes affect the number of equilibrium points and the corresponding phase portraits. The analytically obtained results are illustrated by means of simulations.

Keywords: *biochemical reactors; nonlinear systems; stability analysis.*

Mathematics Subject Classification (2000): 34A34, 34A50, 34D20.