Institute of Chemical Engineering

Effect of Nickel as Stress Factor on Phenol Biodegradation by Stenotrophomonas maltophilia KB2

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This study focuses on the phenol biodegradation kinetics by Stenotrophomonas maltophilia KB2 in a nickel-contaminated medium. Initial tests proved that a nickel concentration of 33.3 mg·L−1 caused a cessation of bacterial growth. The experiments were conducted in a batch bioreactor in several series: without nickel, at constant nickel concentration and at varying metal concentrations (1.67–13.33 g·m−3). For a constant Ni2+ concentration (1.67 or 3.33 g·m−3), a comparable bacterial growth rate was obtained regardless of the initial phenol concentration (50–300 g·m−3). The dependence μ = f (S0) at constant Ni2+ concentration was very well described by the Monod equations. The created varying nickel concentrations experimental database was used to estimate the parameters of selected mathematical models, and the analysis included different methods of determining metal inhibition constant KIM. Each model showed a very good fit with the experimental data (R2 values were higher than 0.9). The best agreement (R2 = 0.995) was achieved using a modified Andrews equation, which considers the metal influence and substrate inhibition. Therefore, kinetic equation parameters were estimated: μmax = 1.584 h−1, KS = 185.367 g·m−3, KIS = 106.137 g·m−3, KIM = 1.249 g·m−3 and n = 1.0706

Metryczka

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