

## 利用DN2菌株对烟草工业废弃物中的烟碱降解的工艺参数优化

### Degradation of nicotine in tobacco waste extract by *O. intermedium* DN2

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中文摘要:

利用 *Ochrobactrum intermedium* DN2 对烟草废弃物中烟碱进行降解。采用 Box-Behnken 法研究和探讨初始 pH 值、接种量和温度对菌株 DN2 降解烟碱的影响, 获得了二次模型。结果表明, 该模型极显著。在  $\alpha=0.05$  水平下, 各因素对烟碱降解率的线性效应和曲面效应皆显著; 初始 pH 值与接种量, 接种量与温度的交互作用显著, 而初始 pH 值与温度的交互作用不显著。通过对二次方程求解得知, pH 值为 7.27, 接种量为 14.93 g/L, 培养温度为 31.85℃ 时, 烟碱降解率的最大预测值为 66.13%, 而实测值为 64.82%, 证明模型合适有效。在上述最适培养条件下, 考察了菌株 DN2 对烟草废弃物中烟碱的降解过程。结果表明, 36 h 烟碱降解率为 83.83%, 其降解过程符合 Monod 模型的零级反应, 动力学方程为:  $C(t) = -46.977t + 2244.7$ ,  $r = 0.9595$ 。本试验结果证明 *O. intermedium* DN2 具有实际应用价值。

英文摘要:

In this study, the effects of the initial pH value, the levels of inoculum and culture temperature on nicotine degradation were investigated in flasks using a novel nicotine-degrading bacterium, *Ochrobactrum intermedium* DN2. A Box-Behnken experimental design was applied in the design of experiments and in the analysis of the experimental data. When  $\alpha=0.05$ , three linear coefficients and all quadratic coefficients were significant. Among the interaction effects, the interaction coefficients of the initial pH value vs. levels of inoculum, levels of inoculum vs. culture temperature were significant, while the interaction coefficient of the initial pH value vs. culture temperature was not significant. The experimental data also allowed the development of an empirical model describing the interrelationship between independent and dependent variables. By solving the regression equation, the optimal values of the variables were determined as follows: the initial pH value of 7.27, level of inoculum of 14.93 g/L, temperature 31.85℃, with the corresponding  $Y=66.13\%$ , while actual value was 64.82%, indicating that the model is satisfactory and practicable. Under these conditions, process of nicotine degradation in tobacco waste extract was also carried out. The results showed that 83.83% of nicotine was degraded in 36 h, the degradation process of nicotine followed zero-order reaction of Monod model. These results indicate that strain DN2 is of application value in nicotine pollution treatment.

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