

催化、动力学与反应器

## 金属卟啉仿生催化氧化邻硝基甲苯绿色合成邻硝基苯甲醛

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摘要

针对目前邻硝基苯甲醛 (ONBD) 生产方法中存在环境污染和设备腐蚀严重等问题, 研究了一种金属卟啉仿生催化氧气液相氧化邻硝基甲苯 (ONT) 绿色合成邻硝基苯甲醛的新方法。考察了不同金属卟啉催化剂对上述反应的影响, 发现催化剂的中心金属离子种类及环外取代基的种类和位置对催化剂的性能均有不同程度的影响。系统地考察了反应时间、碱浓度、反应温度等因素对反应的影响, 并对反应条件进行了优化。结果表明, 以  $2 \times 10^{-6} \text{ mol} \cdot \text{L}^{-1}$  的 T(*o*-Cl)PPZn 为催化剂, 在  $5 \text{ mol} \cdot \text{L}^{-1}$  NaOH-甲醇溶液中于  $40^\circ\text{C}$ 、1.5 MPa 的条件下反应 4 h, 邻硝基甲苯的单程转化率可达 47.8%, 邻硝基苯甲醛的选择性和收率分别达到 54.2% 和 25.9%。

关键词

[邻硝基苯甲醛](#) [金属卟啉](#) [仿生催化](#) [氧气氧化](#) [邻硝基甲苯](#)

分类号

## Novel green synthesis of *o*-nitrobenzaldehyde by oxidation of *o*-nitrotoluene with metal porphyrins as biomimetic catalysts

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### Abstract

*o*-Nitrobenzaldehyde (ONBD) is an important intermediate for preparing medicine and fine chemicals. But there are serious problems in present industrial production methods, such as environmental pollution, equipment corrosion, and high energy consumption. A novel green synthesis of *o*-nitrobenzaldehyde by dioxygen oxidation of *o*-nitrotoluene (ONT) with metal porphyrins as catalysts was investigated in order to solve the above problems. The results showed that conversion of *o*-nitrotoluene was up to 47.8%, and the maximum selectivity and yield of *o*-nitrobenzaldehyde were 54.2% and 25.9% respectively under the optimum conditions:  $2.0 \times 10^{-6} \text{ mol} \cdot \text{L}^{-1}$  of T(*o*-Cl)PPZn catalyst,  $5.0 \text{ mol} \cdot \text{L}^{-1}$  of NaOH concentration, and  $40^\circ\text{C}$ , 1.5 MPa for 4 h. The effects of center metal ions and substituents as well as their positions in the ring of porphyrin on the activity and selectivity of the above reaction were also studied, and the results showed that center metal ions and substituents as well as their positions in the ring of porphyrin had very different effects on the activity and selectivity of such a reaction.

### Key words

[o-nitrobenzaldehyde](#) [metalloporphyrins](#) [biomimetic catalysis](#) [dioxygen oxidation](#) [o-nitrotoluene](#)

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