# Effective electrocatalytic elimination of chloramphenicol: Mechanism, degradation pathway, and toxicity assessment

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# Abstract

The residual antibiotics in different environmental media pose a serious threat to human health and the ecosystem. The high-efficient elimination of antibiotics is one of the foremost works. In this study, chloramphenicol (CAP) was eliminated efficiently by electrocatalytic advanced oxidation process with carbon nanotubes/agarose/indium tin oxide (CNTs/AG/ITO) electrode. The influences of different experimental parameters on the degradation efficiency were systematically studied. Under the optimal conditions (4 V potential, 10 wt% CNTs dosage, and pH = 10), the maximum degradation efficiency of CAP (20 mg $L^{-1}$) achieved 88% within 180 min. Besides, the electrocatalytic degradation pathway and mechanism for CAP were also investigated, $\bullet O_2^-$ played a major role in the process of electrocatalytic degradation. Based on the QSAR (quantitative structure-activity relationship) model, the toxicities of CAP and identified intermediates were analyzed. Compared with the parent compound, the maximal chronic toxicity of intermediate ((E)-3-(4-nitrophenyl)prop-1-ene-1,3-diol) for daphnid increased 197-fold. Besides, the hybrid toxicity of the degradation system was further confirmed via disk agar biocidal tests with *Escherichia coli* ATCC25922, which changed slightly during the degradation process. Based on the above results, it is worth noting that the degradation pathway and toxicity assessment should be paid more attention to the treatment of antibiotic wastewater.


# Full Text

This preprint is available for download as a PDF.

# Figures

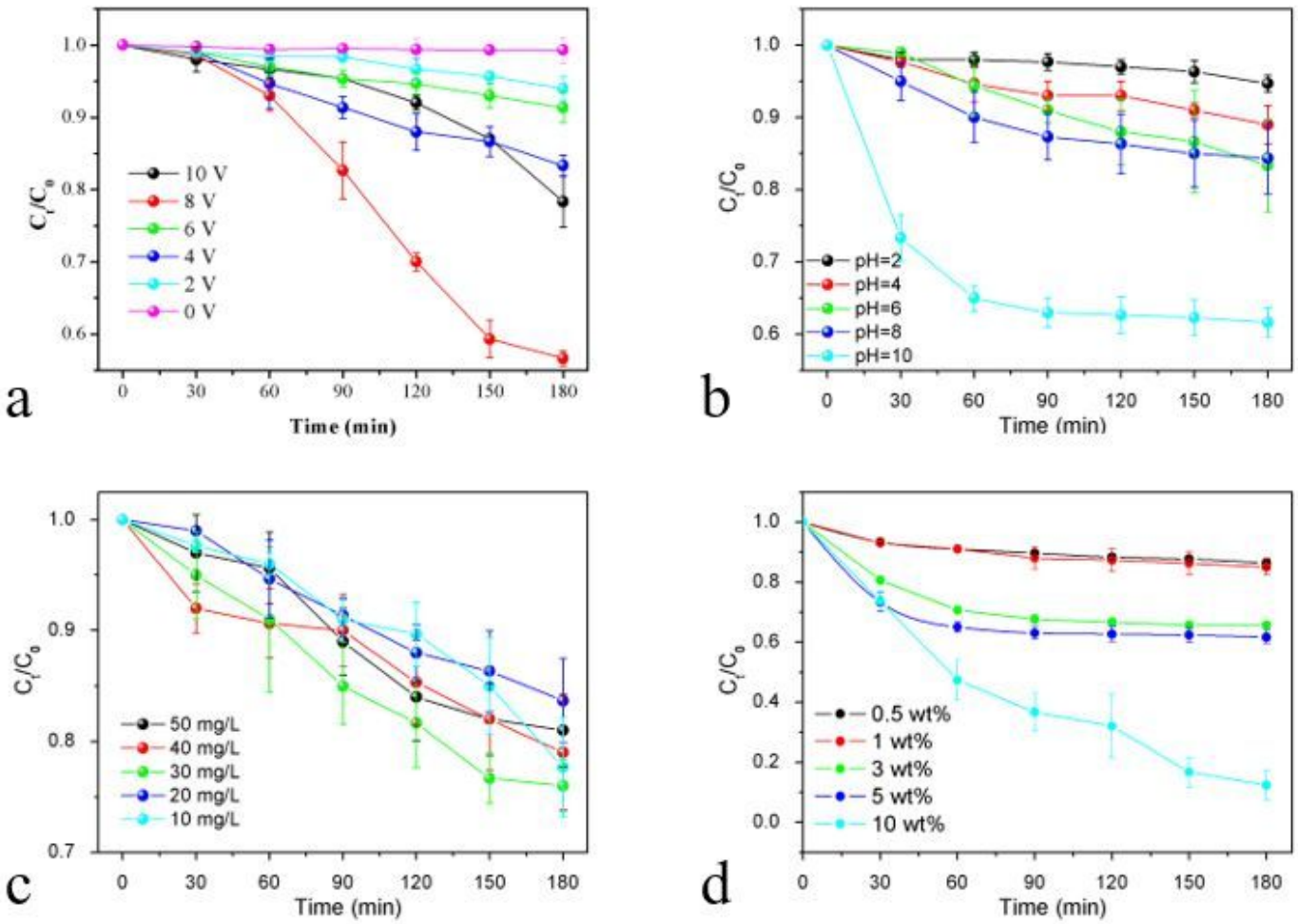



**Figure 1**

Effects of different parameters on the electrocatalytic degradation: (a) potential, (b) pH, (c) initial concentration, and (d) CNTs dosage

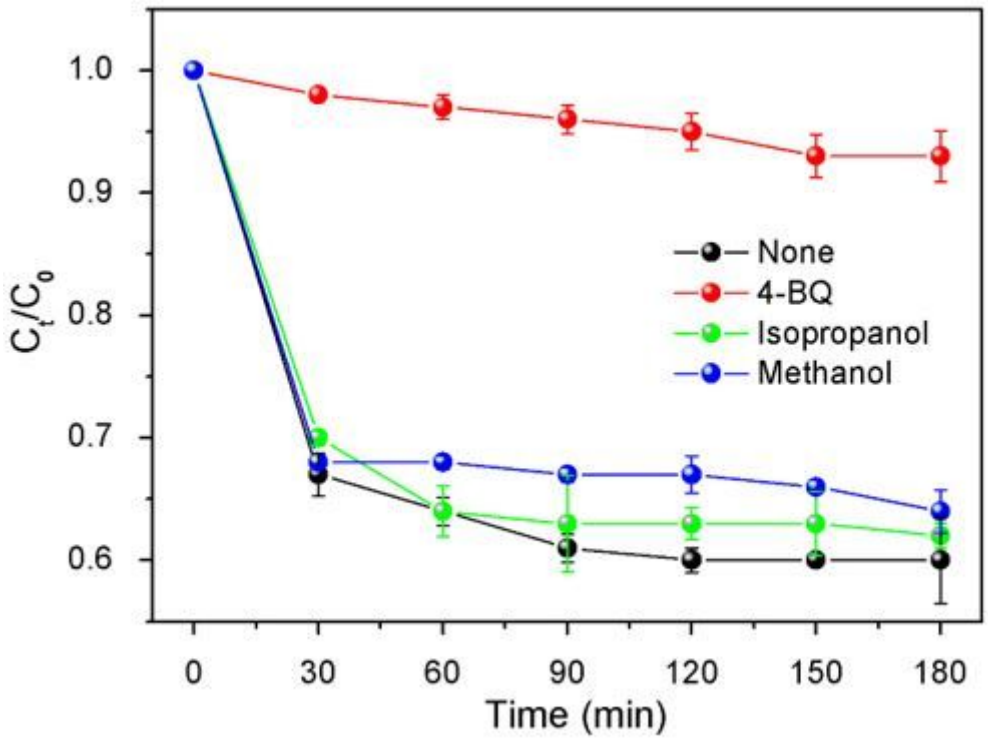
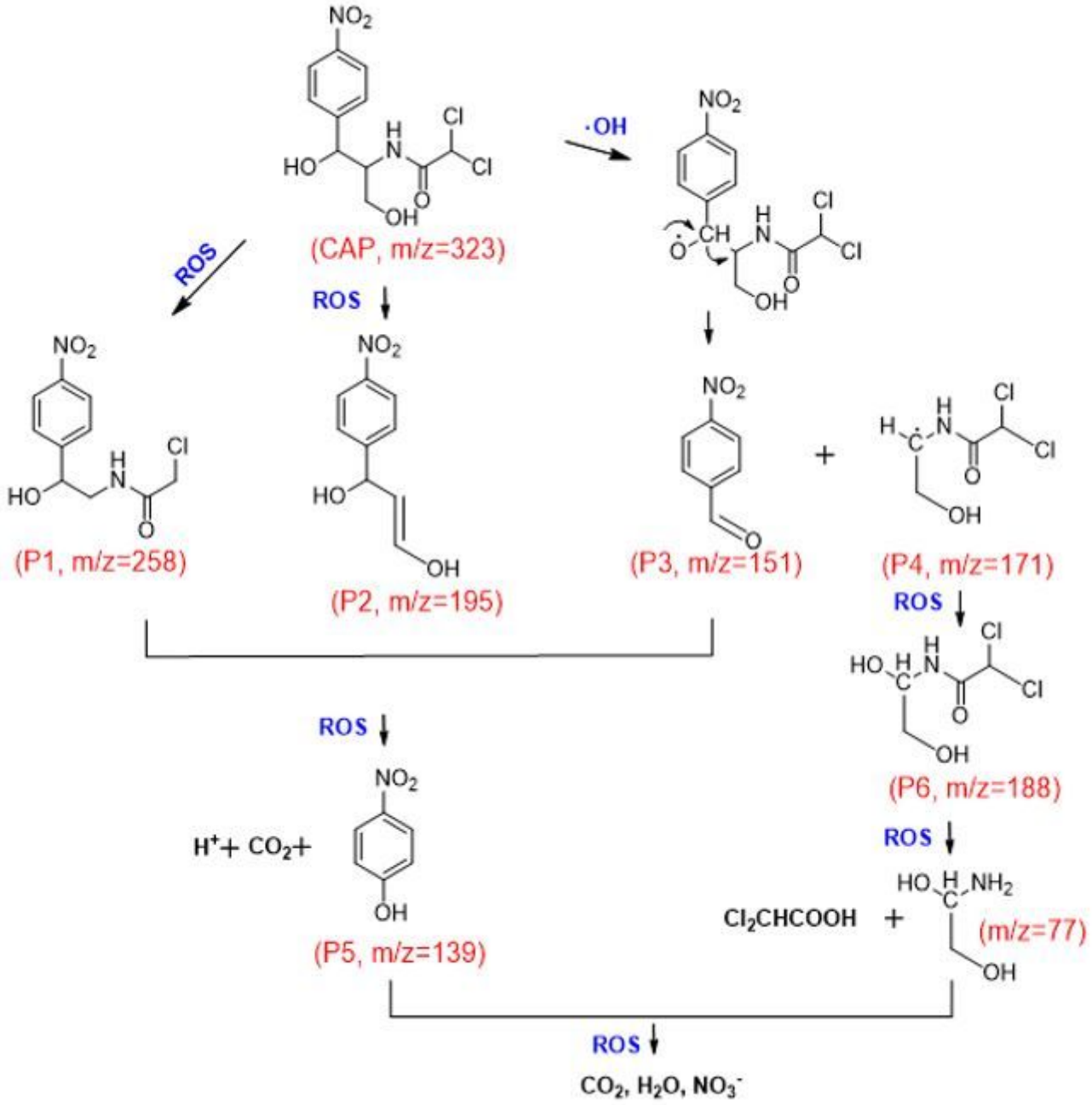


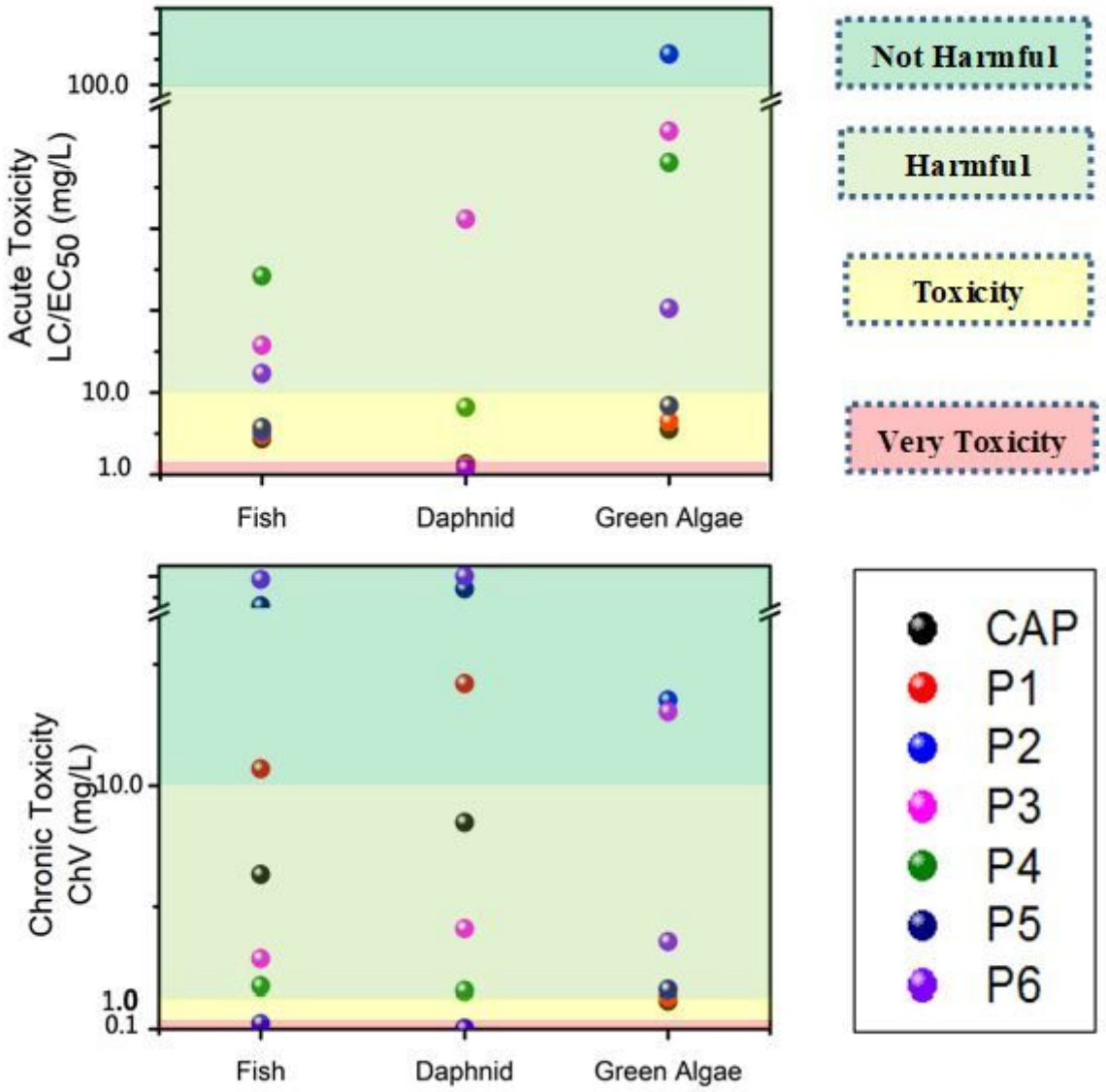

**Figure 2**

Electrocatalytic degradation of CAP with the addition of scavengers




## Figure 3

Possible pathways of electrocatalytic degradation for CAP




## Figure 4

Toxicity prediction for CAP and the main intermediates The coexisting biotoxicity of CAP and intermediates for E. coli 25922 was shown

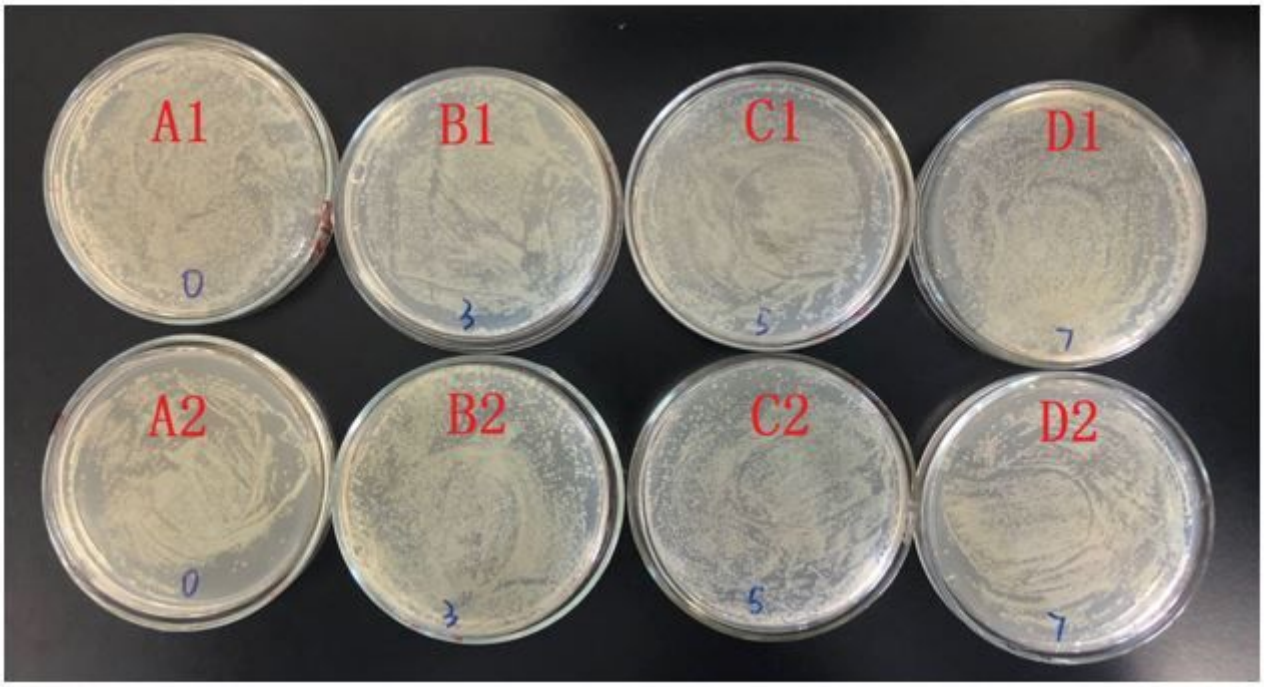



**Figure 5**

Biotoxicity of CAP and intermediates for E. coli 25922

## Supplementary Files

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- SI0326.doc