

## 硫酸亞鐵加藥量對Fenton法處理丙烯腈溶液之影響

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### 摘要

本研究以Fenton法處理丙烯腈(Acrylonitrile)溶液,探討硫酸亞鐵加藥量對Fenton法處理丙烯腈溶液之影響及Microtox生物毒性變化,另外並探討由Fenton反應後之pH值調整對丙烯腈去除之影響。研究結果顯示Fenton法對丙烯腈之處理效果在固定過氧化氫濃度下,其去除效果隨著硫酸亞鐵量之增加而增加,其在本研究之硫酸亞鐵劑量範圍內之去除率最高可達85%,由此可知丙烯腈在Fenton法處理下硫酸亞鐵量越高,丙烯腈分解越完全。在硫酸亞鐵對Microtox毒性之影響實驗中,可發現Fenton反應後毒性比原來丙烯腈強,但在沈澱過濾後毒性降低,其趨勢依加入之 $\text{FeSO}_4$ 量越多,溶液之毒性也相對越強。另外,發現在 $\text{pH}=3$ 時,其毒性以急毒性為主,而在 $\text{pH}$ 由3調整至7後,其毒性以緩毒性為主。另以HPLC加以分析其主要產物,藉以了解生物毒性及其產物間之關係,結果發現丙烯腈在Fenton法處理後濃度減少,但會產生使毒性增加之物種。

關鍵詞: Fenton、Microtox、丙烯腈、總有機碳

### 前言

台灣ABS(Acrylonitrile-Butadiene-Styrene)樹脂原料年產量佔全球年總生產量之28%,其水質成份特性分析分析TKN/COD=0.13, TKN/COD=0.17-0.38,為一典型之含高有機氮廢水。此類廢水往往含有具生物毒性或抑制性之化合物,造成生物處理的困難性,進而影響生物程序之除氮效率,含氮有機污染物或氮化物被排放於承受水體,將使水質惡化,甚至危害人體健康。近年來,Fenton及其相關技術在廢水中難分解有機物的去除,以及受污染土壤的復育等領域漸受重視。Fenton反應是由過氧化氫及亞鐵離子在反應過程中,產生具強氧化力的 $\cdot\text{OH}$ ,因此可有效的去除許多難分解的芳香族化合物。

Fenton法具有強氧化之功能,因此常被用於各種難分解性的有機物之處理。其中對於反應過程中,所加入之 $\text{H}_2\text{O}_2$ 及廢水中有機物之分解速率的研究,仍在陸續發展中。以Fenton氧化程序處理廢

## ABSTRACT

### Effect of Ferrous Sulfate Dosage on the Removal of Acrylonitrile from Aqueous Solution by Fenton Method

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#### ABSTRACT

In this study, Fenton reagent was used for the removal of acrylonitrile from aqueous solution. Effect of ferrous sulfate dosage on acrylonitrile removal and the toxicity of solution after Fenton reaction were evaluated. In addition, pH adjustment of solution after Fenton reaction to enhance the removal efficiency was also estimated. The experiment results showed that the removal efficiency increased with the increase in ferrous sulfate dosage, and the highest removal efficiency of 85% was obtained in the study. As for Microtox test, the toxicity of solution after Fenton reaction was larger than raw solution and the level increased with the increase in ferrous sulfate dosage. In fact, HPLC analysis showed that the concentration of acrylonitrile after Fenton reaction was lower than raw solution; moreover, some products existed in the solution. It indicated that the reaction products were more toxic than acrylonitrile. However, the toxicity was reduced after Fenton reaction followed the pH adjustment and settling. The results also showed that the Fenton reaction of solution resulted in the acute toxicity. On the other hand, the operation of Fenton reaction followed the pH adjustment and settling resulted in the chronic toxicity.

**Key words:** Fenton, Microtox, Acrylonitrile, Total organic carbon.