以VUV相關高級氧化程序進行染料廢水脫色反應之研究

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摘 要

本研究旨在研究含真空紫外線高級氧化程序(AOPs)處理染料廢水的分解反應分。探討反應因子有pH值、VUV強度、初始染料濃度、H2O2初始濃度和TiO2劑量對偶氮染料：Acid Orange 8、Acid Blue 29、Acid Blue 113進行研究，探討和比較AOPs的處理效應。 在VUV強度期間，則觀察未由H2O2和TiO2加以氧化時，偶氮染料的分解情形。結果發現，pH值對3種染料的分解影響佔有重要的角色。就VUV/H2O2、VUV/TiO2和VUV/TiO2/H2O2的處理過程中，除非只使用真空處理者，否則3 種偶氮染料的脫色率，在酸性條件下，相較於鹼性條件下，則有更高的分解效應。尤其是因為在TiO2的正電批覆表面上，3種偶氮染料出現在酸性的VUV/TiO2和VUV/TiO2/H2O2處理過程中。可忽略真空紫外線強度對分解反應的影響。另外一方面，由於染料的分解率隨H2O2濃度的增加而降低，但H2O2的濃度過高，因為成為羥自由基的清除作用，而讓速率降低。研究結果顯示，分解率隨偶氮染料濃度的增加而降低。本研究使用的TiO2最佳濃度為0.5 g / L，若超過最佳濃度，因為對TiO2的真空紫外線的效果阻礙作用，而降低分解率。單偶氮染料(Acid Orange 8)的分解率，則高於雙偶氮染料(即Acid Blue 29)和雙偶氮染料的氨基AZO苯物質(即Acid Blue 113)。實驗結果則依據分子結構的差異性而加以說明。 在VUV處理的AOP物質中，真空紫外線直接光解的效應，可因為3種偶氮染料能夠有效由真空紫外線加以分解處理而忽略。在VUV/TiO2/H2O2處理過程中的染料分解處理效應最低，可能是因為有過量的TiO2和H2O2而延緩產生羥自由基的活性。就真空紫外線處理的AOP物質則建構有準一級反應動力學，但直接光解反應的動力則列為零級，此反應則更應列為第一級反應。在TiO2表面的3種偶氮染料的鉀吸收特性，則使用 Langmui-Hinshelwood的動力模型來判定。此外，在VUV/H2O2處理過程中，依據一般可接受的元素反應特性，建構準穩定態(PSSA)的假設。在染料和羥自由基的反應速率常數，則由PSSA動力模型中的資料適用性找到。

關鍵詞 : 高級氧化程序 ; 真空紫外線輻射 ; 偶氮染料 ; 廢水處理 ; VUV/TiO2 ; VUV/H2O2 ; VUV/TiO2/H2O2

目錄

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