

# 揮發性有機物於含界面活性劑噴霧系統中之去除效率研究

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## 摘要

本研究主要目的在於以噴霧洗滌塔(ATOMIZED MIST SCRUBBING SYSTEM)藉由添加界面活性劑於洗滌液之方式，探討疏水性及親水性有機物於洗滌塔中的去除效率。在實驗程序上，以自行組設一實驗室規模之噴霧洗滌塔反應系統進行連續式氣體吸收實驗，並利用氣相層析儀與吹氣捕集系統分析各有機物之濃度。實驗所選用之疏水性有機化合物為正辛烷(N-OCTANE)及正己烷(N-HEXANE)，另外並選用水中溶解度較佳之甲苯(TOLUENE)、甲醇(METHANOL)以及甲基第三丁基醚(METHYL TERTIARY BUTYL ETHER, MTBE)作為對照之物種，而以陰離子型之十二烷基磺基鈉(SODIUM DODECYL SULFATE, SDS)與非離子型之TRITON X-100為實驗之界面活性劑。研究結果顯示：(1)當在霧滴中添加SDS濃度為 $1.5 \times 10^{-2}$  M (3.8 G/L)時，正辛烷之去除效率達60.1%，若與不添加SDS之去除效率比較，其增溶倍數可達到2.5-5.3倍；另外甲苯以及甲醇對於SDS的增加，其去除效率並無明顯的提升。(2)當在霧滴中添加TRITON X-100濃度為 $5 \times 10^{-4}$  M (0.314 G/L)時，正辛烷之去除效率可達56%，其增溶倍數可達到1.5-3.7倍。(3)當分別使用最佳SDS與TRITON X-100添加濃度(即達到最佳吸附效果時之濃度)，並控制通入反應器中「液-氣比」(L/G RATIO)由1/4,500增加至1/465，在SDS系統中，正辛烷之去除效率增加2倍，甲醇與MTBE之去除效率則增加1.4-1.5倍，而甲苯之去除效率則無明顯之變化；在TRITON X-100系統中，正辛烷之去除效率分別增加1.8倍，甲醇之去除效率則增加1.2倍，由此顯示反應系統之操作「液-氣比」對目標污染物之去除有明顯的影響。(4)當反應器中的VOCS之入口濃度逐漸增加，則正辛烷及甲醇之去除效率呈逐漸下降的趨勢。(5)在同時通入正辛烷及甲醇之兩種物種時發現，正辛烷的去除效率仍然會隨著SDS濃度之增加而增加，最佳去除效率可達到55%，比單獨通入正辛烷時之去除效率(62%)稍微降低，甲醇方面則較不受影響。(6)在噴霧塔不同斷面採樣分析得知，隨著軸向斷面長度逐漸增加時，有機物之去除效率也會隨之增加。另本研究根據噴霧洗滌塔對正辛烷去除效率之實驗數據，利用統計軟體SPSS之非線性迴歸方式推估噴霧洗滌塔去除效率(RE)與界面活性劑SDS濃度(S)、洗滌塔之液體流量(L)、洗滌塔之氣體流量(G)及VOCS進流濃度(V)之間的關係式，所得之推估方程式為。由此顯示，洗滌塔之去除效率與界面活性劑之濃度、液體流量成正相關，而與氣體流量、VOCS進流濃度成負相關。進一步使用F-TEST來檢定此迴歸方程式之顯著水準，檢定結果發現此迴歸方程式具有大於99%之可信度(即P

關鍵詞：正辛烷、SDS、TRITON X-100、噴霧洗滌塔、迴歸方程式

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