

計畫名稱：科學園區過氧乙醯硝酸酯前驅物調查及檢測方法驗證之研究

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### 成 果 摘 要

本計畫為建立國內有關硝酸烷類及過氧乙醯硝酸酯(PANs)等污染物之前驅物的背景濃度資料，探討光化二次污染物與前驅物時空及氣象條件的關聯性以及建立硝酸烷類及PANs等污染物之前驅物分析方法草案。在硝酸烷類及PANs等污染物前驅物關聯性部份，在石化工業區下風處潮州進行逐時連續量測，觀察到碳氫化合物(HCs)與毫無同源性的氟氯碳化物(CFCs)變化出現同調性，觀測到的空氣團應是由遠距外傳輸至潮州，也說明由當地的排放的干擾不顯著，配合氣象資料，與硝酸烷類、臭氧濃度等逐時變化資料可以推論西南風所行經的上風處應有VOC與NO<sub>x</sub>的高排放源，以林園為中心的石化工業區應該是最可能的目標，在此部份所發現臭氧、硝酸烷類及前驅物時空及氣象條件之間關聯性的重要成果，將可提供未來光化二次污染物對環境影響相關研究之參考。對於硝酸烷類及過氧乙醯硝酸酯(PANs)等污染物之前驅物的背景濃度量測，計畫進度已完成新竹科學園區26個樣品及高雄林園工業區24個樣品之採樣分析。另外，硝酸烷類(organic nitrate)及過氧乙醯硝酸酯(PANs)等污染物之前驅物(HCs)分析方法草案之研擬，已建立包含冷凍濃縮-GC/ECD, GC/FID分析方法及C<sub>2</sub>-C<sub>10</sub> HCs連續量測方法，並將其應用於上述相關研究分析中。除了上述兩類物質，過氧硝酸酯因熱穩定性低，因此並無法購得標準品，用於濃度校正或滯留時間定性所需之純物質必須自行合成，且合成與貯存都須在低溫下進行，本計畫目前已完成合成及分析，借此建立台灣對於硝酸烷類及過氧乙醯硝酸酯等物質分析的技術基礎。

The objectives of this project is to develop analytical methods for the measurement of precursors of peroxyacylnitrates and other organic nitrates which are the products of photochemistry through reactions involve volatile organic compounds and NO<sub>x</sub> in the presence of sunlight. Both grab sample technique and in-situ GC technique were employed in this work aiming at targeting temporal distribution of organic nitrates. Two industrial parks were selected for grab sampling, namely the Science Based Industrial Park in Hsinchu city and Linyeng petroleum industrial park in Koushung county. Monthly sampling was performed in these two locations with a total of 26 samples taken from the Science Based Park; and 24 sampes taken from the Petroleum Industrial Park.

In a separate study an in-situ GC/FID/ECD was deployed in Chaujou, presumably a downwind site of Linyen. Clear diurnal pattern for organic nitrates was observed which exhibited a synchronous pattern to the ozone cycle, strongly suggesting the formation of ozone and organic nitrates are the result of photochemistry.

This project also attempted to synthesize peroxyacetyl nitrate (PAN) and develop in-situ monitoring method for PAN as this compound is thermally unstable and hence not commercially available for species identification. This compound was successfully

synthesized and identified via the validation of retention time and thermal decomposition. Preliminary monitoring system was developed and the in-situ data of PAN was obtained, which showed peak concentration at noon, also in consistent with the maximum ozone concentration.

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