

計畫名稱：空氣污染物自動連續測定儀各偵測原理之準確性評估

計畫編號：EPA154920057

計畫執行單位：財團法人成大研究發展基金會

計畫主持人(包括協同主持人)：許逸群，陳志傑，蔡俊鴻

計畫期程：92年01月22日起92年12月31日止

計畫經費：壹佰肆拾萬元整

摘要

本研究乃評估現行公告粒狀污染物及氮氧化物之自動連續檢測方法之差異。藉由實驗室模擬測試，比較粒狀物及氮氧化物之自動連續檢測方法其「檢測原理」、「適用範圍」、「干擾物質」、「偵測極限」、「反應時間」之差異。配合現場比對測試另篩選不同類型之大氣及排放管道，以同時間、同污染源地點之現場連續監測，比較粒狀污染物及氮氧化物各兩方法實測數據之差異，並評估其數據準確性及相關性。

研究結果顯示粒狀污染物及氮氧化物自動連續檢測方法之準確度間，確實存在著差異。粒狀物部分，TEOM測值與濾紙採樣值接近，VEREWA測值則略高於濾紙採樣值；VEREWA在低濃度(小於 $10 \mu\text{g}/\text{m}^3$)時有偵測不到測值的情形。不同溼度(8%、30%、50%與70%)對於兩粒狀物方法測值影響不大。Nafion Dryer搭配TEOM使用，將嚴重低估懸浮微粒之粗粒徑($2.5\sim 10 \mu\text{m}$)質量濃度。

氮氧化物部分，高於5% CO_2 致兩排放管道氮氧化物方法之正干擾現象相當明顯，CLD受8% CO_2 干擾影響較NDIR顯著。CO致兩排放管道氮氧化物方法之干擾現象不明顯。 NH_3 致周界空氣 NO_x 自動儀監測之正干擾現象明顯， NH_3 干擾臨界濃度約為20 ppb。

his research investigates the accuracy differences between the automatic monitoring methods of PM10 (beta-gauge and TEOM) in ambient air and NO_x (NDIR and CLD) inside the stack. The estimated items in laboratory include the principles, the ranges of monitoring concentrations, interferences, the detection limits and the response times. Field samplings work at the same time to compare the factual differences in monitoring data for the above automatic monitoring methods of PM10 and NO_x . We summarize the fruitful results as following:

On the part of PM10, the results of uniformity test showed that the beta count increased with decreasing uniformity, indicating that the beta gauge might underestimate when non-uniform aerosol deposition occurred. From the perspective of response time that Wedding took longest (3 hours) to reach stable concentration, while VEREWA and TEOM can attain stable concentrations within one hour. In terms of accuracy, TEOM has the best agreement with the filter method. The relative humidity had no obvious effect on the performance of these real time instruments. The mass attenuation coefficient was found to decrease with increasing Z/A value, indicating a strong material dependence. The test results of Sample Equilibration System revealed that Nafion removed the water effectively. In the ambient RH range from 20% to 90%, moisture could be maintained around 20% in the sensing unit after the ambient air passing through the SES.

On the part of NO_x, the measured results of the detection limits for the automatic monitoring methods of NDIR and CLD were 1.4 and 8.6 ppm, respectively. The results of interfered tests by CO₂ showed that NO monitoring values both increased with increasing CO₂ concentrations, indicating that NO monitoring values of NDIR and CLD inside the stack might overestimate when the additive interference occurred, CO₂ concentrations more than 5% especially. On the other hand, the additive interference of NH₃ were obvious and non-linear in ambient NO monitoring. The critical concentration was about 20 ppb.

關閉視窗