行政院環境保護署 環檢所 委託計畫

計畫名稱：水中Geosmin及2-Methylisoborneol檢測方法之建立
計畫編號：EPA-91-E3S3-02-02
計畫執行單位：財團法人成大研究發展基金會
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成　果　摘　要

本計畫探討飲用水樣品中土臭味物質之分析方法之建立與應用，主要以固相微萃取分析方法以檢測水中Geosmin及2-Methylisoborneol (MIB)之檢測方法。研究結果顯示，固態微萃取法(solid-phase microextraction, SPME)作為濃縮方法，配合氣相層析質譜儀分析兩種常見之土霉味物質2-MIB與geosmin，檢量線製備結果顯示在0到50 ng/L、及50到1000 ng/L線性效果良好。方法偵測極限測試2-MIB與 geosmin 偵測極限測均小於1.0 ng/L。品保與品管的樣品包含重複樣品、查核樣品、添加標準品、試劑空白樣品等分析，各樣品皆符合品保品管目標。樣品保存期限測試結果顯示，原水中2-MIB或geosmin濃度在十四天保存期限實驗內，濃度變化均介於70%到130%之間，且並不需要添加氯化汞，清水部分則多數樣品在在十四天保存期限實驗內也合於前述濃度範圍，但仍有少數樣品超過。

淨水廠現場樣品測試結果顯示，分析結果均能達到精密度、準確度等品管要求。坪頂、澄清湖、拷潭及鳳山等四個淨水廠採樣分析結果顯示，四個水廠中以鳳山水庫臭味物質濃度最高，所有水廠的各個流程均可以清楚看到有兩種臭味物質之存在，且不論是Geosmin或2-MIB濃度均超過各該物質之文獻中記載之嗅覺閾值。水中餘氯會影響SPME方法對土霉味物質的分析結果，geosmin與2-MIB的濃度越低，餘氯的濃度越高時，其影響越顯著。若以硫代硫酸鈉作為除氯劑，則其濃度可以恢復到原先之95%以上，顯示硫代硫酸鈉適合作為除氯劑。但若以抗壞血酸作為除氯劑時，2-MIB與geosmin濃度會遭低估，顯示不宜以抗壞血酸做為除氯劑。

最後，本計劃並已進行分析技術轉移，並完成標準方法草案。

The technique for analyzing two musty odor compounds, Geosmin and 2-Methylisoborneol (2-MIB), in drinking water was developed in this study. A solid-phase microextraction (SPME) concentration technique coupled with gas chromatograph and mass spectrometric detector (GC/MSD) was established to quantify the two ordants. Based on the technique developed, field samples were than collected and analyzed.

Experimental results showed that the calibration curves for these two compounds were highly linear between 2 and 100 ng/L and were with high regression coefficients ($R^2 > 0.995$). The method detection limit for 2-MIB and geosmin were 0.48 and 0.24 ng/L, respectively. All the quality control samples, including duplicate, blank, laboratory control standard, and laboratory fortified matrix standard, follows the general quality control objectives for chemical analysis. The storage time of field samples were determined to be 14 days for raw water, while it is only 7 days for the chlorinated finish water. In both cases, no mercury addition was needed for the samples.

Analysis of the filed samples showed that both geosmin and 2-MIB were present in four of the water treatment plants in Kaohsiung Area. Experimental results for the quality control samples coming together with the field samples indicated that the objectives of quality control can be reached. However, if chlorine residual or ascorbic acid was present in the samples, the observed 2-MIB and geosmin concentration will reduce. In those case, sodium thiosulfate was needed to counteract the effect from residual chlorine by dechlorinating the water, while no ascorbic acid should be added into the sample to avoid the experimental error. Based on the experimental results, a provisional standard for the analysis of 2-MIB and geosmin was proposed.