

THE DETERMINATION OF BACKGROUND LEVELS OF VOLATILEORGANIC COMPOUNDS IN THE ATMOSPHERE

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Volatile organic compounds (VOCs) of anthropogenic as well as biogenic origin play an important role in different photochemical processes in the troposphere. In order to evaluate their impact on ozone formation processes, a detailed knowledge about their abundance in the atmosphere is required. There are several different analytical methods available for the determination of background levels of VOC in the air. Sampling can be performed either collecting the whole sample (e.g. canister, bags) or by preconcentration on absorption tubes or cold traps. For their determination gas chromatography using different detectors (FID, ECD, MSD) is applied.

The absorption tubes filled with different adsorption materials (i.e. Tenax, Carbotrap, Carbosieve,) to collect VOC from C₂ to C₁₀ were applied and the absorption efficiency of individual adsorbents was tested. Special attention was dedicated to the sampling of biogenic compounds.

The samples were cryo-refocused after thermal desorption and injected on gas-chromatographic capillary column. Two separation methods were developed. The first one includes separation of C₂ to C₁₀ isomers using nonpolar OV-1 column. Baseline separation of C₂ isomers was obtained by cooling the chromatographic oven to -60°C. To avoid multiple overlapping of chromatographic peaks two-column system was developed. While Al₂O₃/KCl PLOT column was used for the separation of high volatile VOCs (C₂ to C₆) lower volatile VOC were separated using nonpolar DB-5MS column. The identification of VOC was performed using several standards and MS detector, while quantitative results were obtained with FID detector.

Since unspecific fragmentations in the homologous series can hinder identification of the unknown substances during gas chromatographic separation coupled with mass spectrometry, some chemometric approaches have been introduced to solve this problem.

The accuracy of the developed methods was performed by comparison of results obtained by different laboratories during field measurements.