

# Source Allocation of Fine Airborne Particles in Kaohsiung Metropolitan Area by Receptor Models

C. G. Lee\*, C. S. Yuan\*\*, S. H. Liu\*\*, S. W. Liao\*, C. Y. Chung\*

\*Department of Environmental Engineering and Health, Tajen Institute of Technology

\*\*Institute of Environmental Engineering, National Sun Yat-Sen University

## Abstract

Intensive seasonal sampling campaigns were undertaken at an urban location in Kaohsiung, Taiwan, in which ambient particulate matter was sampled by dichotomous samplers and meteorological conditions were monitored simultaneously as well. The dichotomous sampler enabled the collection of suspended particulate matter representative of fine (diameter  $< 2.5 \mu\text{m}$ ) and coarse sized ( $2.5 \mu\text{m} \sim 10 \mu\text{m}$ ) fractions. The samples have been analyzed for a wide range of metallic constituents, elemental carbon and organic carbon, and the soluble ions, such as  $\text{Cl}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ , etc. A receptor modeling study has been conducted using Principal Component Factor Analysis (PCA) followed by Chemical Mass Balance model (CMB) in order to identify potential emission sources and the source apportionment of  $\text{PM}_{2.5}$  in metro Kaohsiung.

The results from PCA demonstrate that geological material related sources, motor vehicle exhaust, secondary aerosols and coal-fired power plant are found to correspond closely to  $\text{PM}_{2.5}$ . Meanwhile, according to the results obtained from CMB, motor vehicle exhaust and secondary aerosols are shown to be the major contributors of  $\text{PM}_{2.5}$  in the Kaohsiung metropolitan area, although other sources such as metals processing, petroleum industry and coal-fired power plant also contribute.

**Key words:**  $\text{PM}_{2.5}$ , Receptor modeling, Principal Component Factor Analysis, Chemical Mass Balance, Source apportionment