

## **Emission Characteristics of Volatile Organic Compounds (VOCs) and Spatial Distribution Modeling in Industrial Parks**

Volatile Organic Compounds (VOCs) are significant atmospheric pollutants that act as precursors to ozone and secondary organic aerosols, profoundly impacting regional air quality and human health. Industrial parks represent major sources of VOC emissions, characterized by complex pollutant species, high emission intensities, and marked spatial heterogeneity, posing challenges for environmental management and pollution control.

A comprehensive understanding of VOC emission characteristics within industrial parks is essential to identify primary sources, dominant pollutant species, and emission patterns, providing a scientific basis for targeted mitigation strategies. Moreover, spatial distribution modeling of VOCs can reveal patterns of dispersion, transformation, and accumulation within the park, aiding in source localization and control optimization.

This study aims to systematically analyze VOC emission characteristics in industrial parks through sampling, source apportionment, and chemical fingerprinting techniques to identify major sources and their contributions. Geographic Information System (GIS) tools combined with atmospheric dispersion models will be employed to develop spatial distribution models of VOCs, simulating pollutant transport and transformation under varying meteorological conditions. Furthermore, statistical analysis and machine learning methods will be utilized to explore key factors influencing spatial distribution, enhancing model prediction accuracy.

The findings are expected to provide theoretical support and technical means for the scientific management of VOC pollution in industrial parks, facilitating green development and improved environmental quality.