

연구논문

전남 대기 중 미세먼지 및 중금속 특성 평가
– 산업단지 인접 지역 중심으로

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Evaluation of PM-10 and Heavy Metal Characteristics in the Atmosphere
of Jeollanam-do
– Focusing on Areas Adjacent to Industrial Complexes

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This study used monitoring data to analyze the PM-10 heavy metal concentrations in Jeollanam-do from 2022 to 2024. Samples were collected for 24 h over 5 d each month. The annual, seasonal, and site-specific variations in PM-10 and metal concentrations were analyzed, and the main sources and emission characteristics were identified through correlation and factor analyses. The average PM-10 concentration during the study period was $27 \pm 17 \mu\text{g}/\text{m}^3$, while the total heavy metal concentration was $1.99255 \pm 1.87673 \mu\text{g}/\text{m}^3$, accounting for $7.2 \pm 5.0\%$ of the PM-10 concentration. Fe, Ca, Al, and Mg were the dominant heavy metals, accounting for over 80% of the total, and the metals, arranged according to their concentrations, followed the order of $\text{Fe} > \text{Ca} > \text{Al} > \text{Mg} > \text{Mn} > \text{Pb} > \text{Cu} > \text{Ni} > \text{Cr} > \text{As} > \text{Cd}$. The proportion of heavy metals in PM-10 remained stable over the years. In terms of seasons, the concentrations were the highest in spring, followed by winter, autumn, and then summer. The site-specific analysis showed that the total heavy-metal concentrations were the highest in Daebul, followed by Myodo-dong, Jung-dong, Yulchon-myeon, Sindae-ri, Yecheon-dong, and then Ssangbong-dong. Factor analysis revealed three major sources: (1) soil-origin components (Fe, Ca, Mg, and Al), (2) vehicle emissions and coal combustion (Pb, Cd, and As), and (3) industrial pollution (Cr, Cu, Mn, and Ni). Furthermore, the Fe concentrations varied by site, with Daebul and Myodo-dong strongly influenced by industrial activities, while other sites were more affected by natural factors.

Key words:

1. 서 론

대기 중 미세먼지는 인류 건강과 생태계에 심각한 영향을 미치는 주요 환경 문제 중 하나이다.¹⁾ PM(Particulate matter)은 유기 및 무기 화합물이 혼합된 형태로 주요 구성 요소에는 탄소성분, 이온성분, 원소성분이 포함된다.

대기 중 중금속 농도 분포는 지역적 특성과 환경 요인에 따라 다양하게 나타나며, 크게 자연적 발생원과 인위적 발생원에 의해 배출된다. 주요 발생원으로는 화학공정, 쓰레기 소각, 화석연료 연소, 암석풍화, 산업활동 등이 있다.^{2,3)}

특히 독성이 강한 중금속은 자연적 배출원보다는 인위적인 활동에서 기인하는 비율이 더 크다. 산업단지가 밀

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