Particulate Matter Characterization and Source Apportionment in Phuket, Thailand

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Abstract : Particulate matter (PM) is essential for comprehending climate change, alleviating negative health impacts, and formulating air pollution management strategies. There isn't enough knowledge about the chemical processes and factors that affect the occurrence and development of particle formation events. This study looked at the number of PM in the air and how they were distributed in size in Phuket province, Thailand, during the dry season (November). it used a cascade impactor (Nanosampler II Model 3182 Specifications) with 47-mm quartz filters and a 40 L min–1 flow rate. Each sample was collected over a period of 120 hours, and then it was properly stored in individual petri slide plates before being placed in the refrigerator. This was done to ensure that the samples' chemical makeup was preserved until further analysis was required. The focus of our research is to find the source of PM in the sampling area, and polycyclic aromatic hydrocarbons (PAHs) have been used for identification and quantification. The Soxhlet extraction method performed the PAHs analysis. the first mixed the sample with an internal standard. it used dichloromethane (DCM) as the solvent and continued the extraction for 8 hours. Finally, it separated the PAHs from the solution using column chromatography, which got it ready for the next step of the analysis process. PAHs are non-polar organic molecules. the accomplished this by integrating in-port thermal desorption with gas chromatography/mass spectrometry (GC/MS). This method allows for the effective separation and identification of PAHs in complex environmental samples. By comparing the results from both techniques, we can gain deeper insights into the presence and concentration of these harmful compounds. For the source appointment of PM in ambient air in Phuket, it used the different forms of PAHs as indicators depending on their sources; there is a method for determining their origins known as the "diagnostic ratio." The result shows the diagnostic ratios employed with their normally reported values for source points in this investigation. The comparisons of (Fluo/Fluo + Pry vs. An/An + Phe) and (B[a]A/B[a]A + Chry vs. Ind/Ind + B[g,h,i]P) showed that most PAHs come from things that people do. Therefore, human activities are the primary source of PAHs in PM samples. PMs that have been conducted in Phuket's ambient air pointed out that the major source of PAHs is thought to be the incomplete combustion of petroleum products, which is caused by the combustion of vehicular exhausts, as well as open burning of agricultural areas to prepare for the next crop season. According to this study, vehicle exhaust and biomass burning are the main sources of PAHs in Phuket's air. This implies that reducing emissions from these sources is crucial for enhancing air quality. Implementing stricter regulations on vehicle emissions and promoting cleaner combustion practices could be effective strategies for mitigating this issue.

Keywords : particulate matter (PM), polycyclic aromatic hydrocarbons (PAHs), air pollutions, source appointment