

Applied chemometric approach in identification sources of air quality pattern in Selangor, Malaysia

ABSTRACT

In recent years, Malaysia has experienced quite a few number of chronic air pollution problems and it has become a major contributor to the deterioration of human health and ecosystems. This study aimed to assess the air quality data and identify the pattern of air pollution sources using chemometric analysis through hierarchical cluster analysis (HCA), discriminant analysis (DA), principal component analysis (PCA) and multiple linear regression analysis (MLR). The air quality data from January 2016 until December 2016 was obtained from the Department of Environment Malaysia. Air quality data from eight sampling stations in Selangor include the selected variables of nitrogen dioxide (NO₂), ozone (O₃), sulfur dioxide (SO₂), carbon monoxide (CO) and particulate matter (PM₁₀). The HCA resulted in three clusters, namely low pollution source (LPS), moderate pollution source (MPS) and slightly high pollution source (SHPS). Meanwhile, DA resulted in two and four variables for the forward stepwise mode and the backward stepwise mode, respectively. Through PCA, it was identified that the main pollutants of LPS, MPS and SHPS came from industrial and vehicle emissions, agricultural systems, residential factors and natural emission sources. Among the three models yielded from the MLR analysis, it was found that SHPS is the most suitable model to be used for the prediction of Air Pollution Index. This study concluded that a clearer review and practical design of air quality monitoring network would be beneficial for better management of air pollution. The study also suggested that chemometric techniques have the ability to show significant information on spatial variability for large and complex air quality data.

Keyword: Discriminant analysis; Hierarchical cluster analysis; Multiple linear regression analysis; Principal component analysis