Chemical Characterization of $PM_{2.5}$ on an Urban Residential Area Near an Industrial Park During Mid-Autumn Festival Period

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The aim of this study is to investigate the chemical characterisation of atmospheric PM2.5 collected in the vicinity of a steelmaking industrial area during the Mid-Autumn Festival in southern Taiwan. PM2.5 samples were gathered in a sampling campaign from 28 September to 5 October 2020. Samples were categorised into before, during, and after the festival. Twenty-seven metallic elements were selected for analysis using ICP-AES and ICP-MS. The results showed that the PM2.5 mass concentrations followed the order of during, after, and before the festival. The highest mean concentrations of Al, As, Ba, Ca, Cu, K, Mg, Na, and Sr were observed during the festival period. These metallic elements were associated with firework activity. Elevated concentrations of Cr, Fe, Mn, Mo, Pb, W, and Zn were observed during the periods before and after the festival. The findings indicate marker elements originating from iron and steel production emissions. The total water-soluble ion mass percentages (NH_4^+, Cl^-, NO_3^-, and SO_4^{2-}) in PM2.5 were low during the festival and higher before and after. Six types of barbecue charcoal from the market were analysed to measure metallic elements. The results showed noticeable variation in concentrations among different charcoal types. Enrichment factors (EFc) confirmed that the main sources of As, Ba, Cu, K, Mg, and Na during the festival were fireworks. High EFc values (>1,000) for Mo, Pb, Sb, Se, Sn, W, and Zn were detected, indicating severe anthropogenic pollution area.

Keywords: Metallic elements; Firework; Barbecue charcoals; Enrichment factors