Assessment of Heavy Metal and Aromatic Hydrocarbons Concentration in Deposited Particulates by Plant Species in Ahvaz City

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Abstract

Green space plants in contemporary cities are perfectly capable of deposition and retention of particulate matter and play a significant role in the purification of polluted urban air. The present paper is aimed at examining heavy metal concentration, aromatic hydrocarbons, and mineralogy of absorbed particulates by plant species in Ahvaz. To this end, samples were collected from different dominant leaf species from 10 locations in Ahvaz which had different land uses (industrial, residential, recreational, and high-traffic) in various time periods. The deposited particulate matter was measured in units of mass, area, and time. The total concentration of 29 elements (K, Na, Ba, Cu, Ni, Co, Ru, Mn, Zn, Pb, Sn, Li, Rb, Cr, B, Ga, Hf, Pd, Cd, Ti, Sr, P, Ag, U, Si, Mo, Fe, Al, and V) was measured after digestion with a mixture of perchloric and nitric acid at the ratio of 1:3 using ICP-Mass. Moreover, the concentration of aromatic hydrocarbons was measured using GC-MS. Changes in clay mineralogy of particulates and particle size distribution were studied using XRD and Master Sizer, respectively. The results of the present research revealed that steel industries in Ahvaz are one of the main sources of particulate matter, but due to the fact that these particles are primarily made of iron, their deposition is more likely to occur at distances close to this source. Particulate matter is generally composed of minerals such as calcite, silicate (quartz) and phyllosilicate. The results obtained from the decomposition of particulate matter indicated that the possible origin of elements in particulates is internal factors such as steel industries in Khuzestan province and urban traffic rather than external factors such as dust phenomenon. Carcinogenic polycyclic compounds are found everywhere in Ahvaz, the most important of which is benzo(a)pyrene, with concentrations ranging from 15 to 31 μg kg^{-1} of particulates. The findings of this study show that different plant species have a significant effect on the deposition of particulate matter and the purification of urban air. Therefore, the extension of green space using plant species with greater deposition can pave the way for reducing urban air pollution.

Keywords: Aromatic hydrocarbons, heavy metal, mineralogy, particulate

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