

## Seasonal and Spatial Variations of Magnetic Susceptibility of Street Dust in Several Cities of Isfahan Province and their Relationship with the Concentration of Selected Heavy Metals

B. Akbari and H. Khademi<sup>1\*</sup>

(Received: June 18-2023 ; Accepted: October 16-2023)

### Abstract

Street dust enters the urban environments due to the resuspension of particles smaller than 100 micrometers. The magnetic properties of street dust and their relationship with the concentration of heavy metals have received less attention from researchers worldwide, and not much study has been performed on this issue in Iran. The objectives of this study were: (i) to investigate the spatial and seasonal changes in street dust, and (ii) to determine their relationships with the concentration of selected heavy metals in several cities in the Isfahan province. Sampling was carried out in the first half of the second month of each season including 20 samples from Isfahan city and 10 samples from Natanz, Shahreza, Falavarjan, Khomeinishahr, and Najafabad. The concentration of selected heavy metals was measured using an atomic absorption spectrometer. Also, the magnetic susceptibility values of the samples at low and high frequencies were determined and frequency-dependent magnetic susceptibility was calculated. The results showed that the presence of ferromagnesian minerals in the parent materials could be the reason for the high values of magnetic receptivity in Natanz City. However, the high level of this characteristic in the street dust of other cities could be due to human activities, especially in Isfahan city. Based on the results of principal component analysis, the high correlation of the first component with magnetic susceptibility and the concentration of zinc, copper, and chromium elements most likely indicates the adsorption of these elements by particles close to superparamagnetic (SP). The high correlation of the second component with frequency-dependent magnetic susceptibility and concentration of nickel and cobalt is most likely related to the adsorption of magnetic elements and heavy metals into coarse polyhedral particles that remained on the street floor after the re-deposition of street dust particles. Also, the high correlations between magnetic parameters and the concentration of copper and zinc confirm their anthropogenic origin. On the other hand, low or negative correlations of Pb, Ni, Cr, and Co concentrations with magnetic susceptibility might indicate confirm their natural or non-anthropogenic origin. The higher values of magnetic parameters of street dust in the spring season reflect the significant contribution of magnetic minerals in this season, compared to autumn and winter, and indicate the higher influence of human activities.

**Keywords:** Urban environment, Atmospheric pollution, Anthropogenic sources, Natural sources, Heavy metal pollution

---

1. Department of Soil Science, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Iran.

\*: Corresponding author, Email: hkhademi@iut.ac.ir