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ASSESSMENT OF SPATIAL DISTRIBUTION AND POLLUTION WITH HEAVY METALS IN ROADSIDE SOILS ALONG XI'AN-BAOJI HIGHWAY IN NORTHWEST CHINA

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Abstract

Xi'an-Baoji Highway is one of the oldest and most important highways in northwest China. In this study, the concentrations (0-20 cm) of Pb, Zn, Cu and Cr at 5-1000 m distances in the roadside soils along Xi'an-Baoji Highway were experimentally determined to analyze their spatial distribution and evaluate their contamination levels. The spatial distribution ($\text{mg}\cdot\text{kg}^{-1}$) of Pb, Zn, Cu and Cr at 5-1000 m distances from the both roadsides (North/South) is, respectively, 23.81-38.45/24.54-36.90, 72.79-121.98/ 76.91-130.60, 24.58-41.60/23.82- 37.31, and 63.83-85.26/64.30-85.94 at Chencang District section, while it is 23.41-45.76/20.95- 42.50, 74.62-135.54/75.15-127.25, 23.94-35.71/22.04-36.91, and 63.82-85.84/64.33-88.53, respectively, at Caijiapo section. Regarding the Pb, Zn, Cu and Cr at Mei County section, it is 25.47-40.89/23.56-32.72, 74.15-131.24/72.67-118.15, 24.00-37.61/25.68-44.99, and 64.00- 89.22/61.90-85.58, respectively. Integrated evaluation via the contamination factor (C_f), contamination degree (C_d) and pollution level index (PLI) showed the moderate pollution level. While geoaccumulation index (I_{geo}) revealed that all evaluated metals were almost unpolluted ($0 < I_{geo}$), only part heavy metal of individual sampled sites were unpolluted to moderately polluted ($0 \leq I_{geo} < 1$). The correlation analysis shown these metals are significantly associated with each other. Interelement correlation is as follows: $\text{Pb}-\text{Cr} > \text{Pd}-\text{Cu} > \text{Zn}-\text{Cu} > \text{Pd}-\text{Zn} > \text{Zn}-\text{Cr} > \text{Cu}-\text{Cr}$. Moreover, the hierarchical cluster analysis suggested that Pb and Zn might be from the identical anthropogenic and natural source while Zn and Cr might have the same original source in the roadside soils along Xi'an-Baoji Highway in Northwest China.

Key words: geoaccumulation index, heavy metals, highway, roadside

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