CONTAMINATION OF TOPSOIL WITH HEAVY METALS AND SELECTED RARE EARTH ELEMENTS AROUND GEBENG INDUSTRIAL SITE, KUANTAN PAHANG

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ABSTRACT

CONTAMINATION OF TOPSOIL WITH HEAVY METALS AND SELECTED RARE EARTH ELEMENTS AROUND GEBENG INDUSTRIAL SITE, KUANTAN PAHANG

Surface soils are the recipients of large amount of heavy metals from a variety of sources such as industries activities, vehicles emission and other activities. In order to obtain a better understanding of the pollution from surface soil, the soil samples were randomly collected at seven locations surrounding Gebeng industrial area. The surface soil have been subjected to a total digestion technique and analysed by using atomic absorption spectrometer (AAS) and inductively coupled plasma-Mass Spectrometer (ICP-MS). The samples have been analysed for Al, V, Mn, Fe, Pb, Ni, Cu, La and Tm. The data obtained in this study showed that the mean concentration (in mg/kg) are as follows: Al (388045); Fe (1097); Mn (125.2); V (37.8); Cu (25.7); Pb (24.3); Ni (11.9); La (0.197) and Tm (0.000002). The Multivariate statistical analysis including cluster analysis (CA) and principle component analysis (PCA), contamination factor (CF), geoaccumulation index (Igeo) and pollution load index (PLI) have been calculated and were used to evaluate the distribution pattern, the contamination levels, and to detect the possible emitters of elements in the study area. The results of PCA and CA that were analyzed in this study clearly shows that the elements can be divided into three groups which are indirectly representing the three possible emitters for the deposition of these elements in the area. Fe, V, Ni, Pb and Cu for (PC1) was estimated contributed by the anthropogenic sources, La and Tm (PC2) were from natural abundance (soil and dust) and Al and Mn (PC3) were released by various possible sources. The Igeo-accumulation index of these metals in the surface soil under this study indicates that all the studied metal are falls under contaminated to extremely contaminated. Overall observations showed that Fe, La and Tm is uncontaminated and was expected occurred naturally in the earth crusts. Contamination Factor values indicate that all sampling locations are suffered moderate contamination to extreme contamination by all metals except Fe, La and Tm. The pollution load index (PLI) measured in this study clearly shows that all the sampling stations were polluted with the studied elements in various levels.