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تقدير تراكيز بعض العناصر في المرائب النظامية وغير النظامية في مدينة الحلة

Estimation of the concentration of some elements in regular and irregular garages in the city of Hilla

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Abstract

The garages are one of the important places in the city, which people may frequent frequently, and because the studies on them are few, we tried to shed light on the polluting elements that cause a threat to the lives of people in that area. Samples were taken from the air by an air extraction device, then samples were taken to the laboratory for analysis by x-ray flouresnse (XRF). The results showed a temporal and spatial variation, as these elements recorded mostly high concentrations in the summer compared to the rest of the other seasons. This results may due to several reasons, including the burning of fuel used for cars, high temperatures and drought, in addition to wind speed. All of these factors contributed to the concentration of pollutants in the study area.

Introduction

Transportation is one of the basic activities in human daily life, and the transportation system in all its details is one of the most important components of the city of Al-Hilla as it is considered a link between the governorates

Human activities in areas with a high proportion of industrial and urban development have contributed in environmental contamination. According to the some of environmental studies, the main source which contribute in contamination by toxic metals in environment is anthropogenic source. The anthropogenic sources of toxic metals in urban air are traffic emission which includes vehicle exhaust and tire wear particles (Taylor and Owens, 2009)

Human Exposure to metals can occur by a many routes such as inhalation. The dominant source of lead into the environment for the past 50 years has motor vehicle which use compound contain on lead .it is used in various industries, perhaps the most important of which is the addition of tetraethyl lead (L.E.T) to car fuel to prevent knocking. As a result of the toxicity of this substance, it has recently been replaced in many countries by another substance, methyl tertiary-butyl ether. Most lead emissions settle near the emission source. Since 60-90% of lead used in fuel is emitted into the air from vehicle exhaust in the form of small particles, a small size helps it stay suspended in the air for longer so lead pollution is a major threat for environment and public health due to the ability of these molecules to accumulate in the human body (Hu, 2002)

Nickel it is a metal widely distributed in the environment, contact with soluble and insoluble nickel compounds can cause a variety of side effects on human health. Human exposure to nickel may occur through food, water, or air. Nickel enters into modern metallurgical industries in a variety of metallurgical processes, such as alloy production, electroplating, production of nickel-cadmium batteries (Genchi *etal*, 2020)

Cadmium exposure is encountered in industries that use pigment, metal plating, some plastics, and batteries. The health implications of cadmium exposure are exacerbated by the relative inability of human beings to excrete cadmium. (It is excreted but then re-absorbed by the kidney.) Acute high-dose exposures can cause severe respiratory irritation. Occupational levels of cadmium exposure are a risk factor for chronic lung disease (through airborne exposure) and testicular degeneration and are still under investigation as a risk factor for prostate cancer. (Jaishankar etal, 2014).

Therefore, because of those things that were mentioned previously in terms of their ability to spread and remain in the air on the one hand and their great impact on human health on the other hand, the concentrations of elements in the air were measured in car garages as well as irregular parking yards.

Material and methods

The study included 11 regular garages and 11 non-formal garages, and the research extended from July 2020 to July 2021. Air dust samples were taken by using a device for collecting dust samples from the air, called vacuum, which contain filter papers that filtered air sample. during all four seasons of the year each season was represented by two readings, one morning and the other evening. After that, the filter papers which contain dust samples that contain the metals under study were kept in petry dishes, and then those samples were sent to laboratories to measure the concentrations of those elements by X-Ray Flouresnse (XRF) device, this method is considered non-destructive analysis.

Results

1- Lead

This element show elevated in its concentration during summer as compared with other seasons as show in table No. 1 and 2.

Table (1) show concentration of lead in regular garage.

regular garages	Summer		Autumn		Winter		Spring	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
A	2.2	4.4	0.76	0.96	0.84	1.1	1.7	1.8
B	1.98	2	1.58	1.6	0.86	0.96	1.78	1.8
C	1.6	1.98	1.2	1.58	0.94	1	1.4	1.78
D	2.4	2.9	0.6	1.2	1.8	2	1.9	2.1
E	2.1	2.8	1.7	2.4	0.84	0.9	1.9	2.6
F	2.8	3	2.4	2.6	0.9	1.1	2.6	2.8
G	1.4	1.6	0.98	1.2	0.76	0.88	1.18	1.4
H	1.15	1.4	0.6	0.66	0.4	0.44	0.95	1.2
I	1.4	1.9	0.82	0.98	0.6	0.76	1.1	1.2
J	2.8	3.6	1.8	2.2	0.8	1.6	2.1	2.4
W	1.77	1.8	1.37	1.4	0.6	0.76	1.57	1.6

Table (2) show concentration of lead in irregular garage.

Irregular garages	Summer		Autumn		Winter		Spring	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
A1	0.73	1.46	0.25	0.32	0.28	0.36	0.56	0.6
B1	0.61	0.66	0.52	0.53	0.28	0.32	0.59	0.6
C1	0.53	0.66	0.4	0.52	0.31	0.33	0.46	0.59
D1	0.8	0.96	0.2	0.4	0.6	0.66	0.63	0.7
E1	0.7	0.93	0.56	0.8	0.28	0.3	0.63	0.86
F1	0.93	1	0.8	0.86	0.3	0.36	0.86	0.93
G1	0.46	0.53	0.32	0.4	0.25	0.29	0.39	0.46
H1	0.38	0.46	0.2	0.22	0.13	0.14	0.31	0.4
I1	0.46	0.63	0.27	0.32	0.2	0.25	0.36	0.4
J1	0.59	0.61	0.48	0.51	0.26	0.33	0.56	0.6
W1	0.59	0.6	0.45	0.46	0.2	0.25	0.52	0.53

2- Nickel

This element show elevated in its concentration during summer as compared with other seasons as show in table 3 and 4.

Table (3) show concentration of nickel in regular garage.

Regular garages	Summer		Autumn		Winter		Spring	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
A	0.0462	0.0487	0.0386	0.0401	0.034	0.0368	0.042	0.0441
B	0.0441	0.046	0.0361	0.038	0.0312	0.034	0.0402	0.0425
C	0.0273	0.0298	0.0176	0.0203	0.013	0.0154	0.0225	0.0251
D	0.042	0.0428	0.0342	0.0367	0.03	0.032	0.038	0.0401
E	0.0242	0.0266	0.0173	0.019	0.013	0.0151	0.0201	0.0223
F	0.0256	0.0276	0.0161	0.0184	0.0102	0.014	0.0201	0.0231
G	0.0241	0.0288	0.0151	0.0174	0.0106	0.013	0.019	0.022
H	0.0204	0.0228	0.012	0.0141	0.0076	0.0098	0.0162	0.0181
I	0.019	0.021	0.011	0.0131	0.0068	0.0088	0.0152	0.0173
J	0.0491	0.0415	0.04	0.0421	0.033	0.038	0.044	0.0468
W	0.019	0.0205	0.0105	0.013	0.0082	0.0083	0.0151	0.0172

Table (4) show concentration of nickel in irregular garage.

Irregular garages	Summer		Autumn		Winter		Spring	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
A1	0.0154	0.0162	0.0128	0.0133	0.0113	0.0122	0.014	0.0147
B1	0.0147	0.0153	0.012	0.0124	0.0104	0.0113	0.0134	0.0141
C1	0.0091	0.0099	0.0058	0.0067	0.0043	0.0051	0.0075	0.0083
D1	0.014	0.142	0.0114	0.0122	0.01	0.0106	0.0126	0.0133
E1	0.008	0.0088	0.0057	0.0063	0.0043	0.005	0.0067	0.0074
F1	0.0085	0.0092	0.0053	0.0061	0.0034	0.0046	0.0067	0.0077
G1	0.008	0.0096	0.005	0.0058	0.0035	0.0043	0.0063	0.0073
H1	0.0068	0.0076	0.004	0.0047	0.0025	0.0032	0.0054	0.006
I1	0.0063	0.007	0.0036	0.0043	0.0022	0.0029	0.005	0.0057
J1	0.0163	0.0138	0.0133	0.014	0.011	0.0126	0.0146	0.0156
W1	0.0063	0.0068	0.0035	0.0043	0.0027	0.0027	0.005	0.0057

3- Cadmium

This element show elevated in its concentration during summer as compared with other seasons as show in table 5 and 6.

Table (5) show concentration of Cadmium in regular garage

Regular garages	Summer		Autumn		Winter		Spring	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
A	0.7	0.88	0.2	0.34	0.1	0.16	0.46	0.52
B	0.56	0.76	0.21	0.32	0.09	0.14	0.4	0.47
C	0.4	0.54	0.19	0.26	0.08	0.17	0.31	0.38
D	0.57	0.74	0.18	0.23	0.08	0.12	0.32	0.41
E	0.4	0.48	0.16	0.26	0.06	0.1	0.3	0.36
F	0.48	0.54	0.17	0.21	0.08	0.11	0.32	0.4
G	0.4	0.43	0.2	0.24	0.1	0.14	0.3	0.36
H	0.4	0.47	0.18	0.2	0.09	0.11	0.31	0.35
I	0.38	0.42	0.16	0.2	0.11	0.18	0.26	0.32
J	0.68	0.82	0.3	0.42	0.22	0.3	0.51	0.6
W	0.38	0.44	0.16	0.22	0.12	0.18	0.28	0.3

Table (6) show concentration of Cadmium in irregular garage.

Irregular garage	Summer		Autumn		Winter		Spring	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
A1	0.3	0.38	0.8	0.14	0.4	0.6	0.2	0.22
B1	0.24	0.33	0.9	0.13	0.3	0.6	0.17	0.2
C1	0.17	0.23	0.8	0.11	0.3	0.7	0.13	0.16
D1	0.24	0.32	0.7	0.1	0.3	0.5	0.13	0.17
E1	0.17	0.2	0.6	0.11	0.2	0.4	0.13	0.15
F1	0.2	0.23	0.7	0.9	0.3	0.4	0.13	0.17
G1	0.17	0.18	0.8	0.1	0.4	0.6	0.13	0.15
H1	0.17	0.2	0.7	0.8	0.3	0.4	0.13	0.15
I1	0.16	0.18	0.6	0.8	0.4	0.7	0.11	0.13
J1	0.29	0.35	0.13	0.18	0.9	0.13	0.22	0.26
W1	0.25	0.3	0.11	0.15	0.8	0.12	0.2	0.23

Discussion

Minerals are a major class of globally distributed pollutants, which are natural elements that have been extracted from the earth and harnessed for industry and human products for thousands of years. Minerals are distinguished by their wide ecological dispersion from such activity; their tendency to accumulate in selected tissues of the human body; and their overall ability to be toxic even at relatively small exposure levels. Some metals, such as copper and iron, are essential to life and play an irreplaceable role in the work of enzyme in bodies of organism. Other metals act exotic chemicals which play important role in human physiology, also lead and mercury became toxic until at rare exposure levels. Even those essential metals, however, have the potential to be harmful at high levels of exposure, according to basic principle of toxicology "A dose makes poison". Exposure to metals can occur through a variety of ways. Metals can be inhaled on dust or smoke form (fine particles, such as lead oxide particles from the combustion of leaded gasoline), metals may be ingested through food and drink (Hu, 2002). Three types of elements were studied, whether in regular or irregular garages, with two morning and evening observations over four seasons of the year.

Lead

Normal range of lead in the atmosphere between 0.5 - 0.6 ng / m^3, and its concentrations in the air of unpolluted rural areas range between 0.05 - 0.1 μg / m^3 (livett, 1992), but these concentrations rise significantly in the atmosphere of cities As a result of the combustion of fuel, the means of transportation contribute about 90% of the input of lead to the air in urban environment (Rachmadiarti etal, 2019).

The results of calculating the concentrations of lead associated with suspended particles in the air of the study area showed a clear spatial and temporal variation in its concentration levels, as it is noted from Table (1) (regular garages), Where the highest concentration of lead was in site A for evening reading in summer (4.4) but the lowest concentration was in site H for morning reading in winter (0.4), while in table (2) (irregular garages). Where the highest concentration of lead was in site A1 for evening reading in summer (1.46), while the highest concentration was in site H1 for morning reading in winter(0.13).As a result of human activities, such as fossil fuel burning, mining, and manufacturing, lead and any lead compounds can be found in all our environment (soil, air, and water) and then may be affect every organ and system in the body. Exposure to lead may be cause damage to the kidneys and brain and later may be cause death (CHSR, 2009).

Nickel

The high level of Nickel concentration consider carcinogenic (cause cancer) to human and animals, also may be cause damage in respiratory system and then cause health affection , vertigo, bronchitis and Asthma (CHSR,2009), so this may be effect on person. Nickel concentration showed a clear spatial and temporal variation in its concentration levels, as it is noted from Table (3, 4). Where we note that the concentrations of the element are high in evening (after twelve noon) observations in the summer compared to the rest of the observations and this may be due to several reasons, including high temperatures, lack of rain, dry soil and increased wind speed, which led to an increase in the suspension of dust particles containing nickel.

Cadmium

Is one of the most toxic elements in the environment and is produced from fuel combustion, mining, alloy processing, and industries that use Cd as dyes. Its concentrations in urban air range between 0.01-0.35 µg/m^3, with higher concentrations in industrial cities. The results showed, as shown in Table No. (5) and Table No. (6), temporal and spatial variation, as the results differed from one site to another, as well as from one season to another and from one reading to another. We note that the highest concentrations were recorded for those elements in the summer, while the lowest concentrations were in the winter, both For regular or irregular garages.

It is noted from table (5,6) that the highest cadmium concentrations were recorded in industrial and traffic sites and to a lesser extent in commercial sites with relative and seasonal variation of the study sites. As for the high concentrations in the summer because of this, it is the lack of rain, dryness of the soil and an increase in wind speed, which helps to re-suspend dust particles containing cadmium in air.

Conclusion

The results showed a temporal and spatial variation for all elements from one site to another and from one season to another, but all the elements showed high concentrations during the evening observations (after twelve noon) in the summer compared to the evening observations for the same season. The same was true for the rest of the seasons. Evening observations were higher than the morning observations. The time of taking the pilgrimage may return, which is after twelve noon (the peak time for movement), which causes an increase in the movement of the soil and a re-suspension of the dust that carries the elements, in addition to the amount of solar radiation higher in the evening, which causes a rise in temperatures.

All of these reasons may be the main reason for the increase in the concentration of elements During the evening observation compared to the morning

As for the seasonal difference in the concentrations of the elements, where we note that the highest concentrations were in the summer than the rest of the elements, the reasons may be due to high temperatures, drought and wind. These factors lead to an increase in the attachment of dust particles carrying elements in the atmosphere during the time of sampling

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