

# Analysis of the Trace Chemical Elements of Stormy Dust in Some Regions of Middle and Southern in Iraq

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## Abstract

The chemical analysis of dust resulting from sandstorms is one of the few studies in Iraq. As this study has a very great importance in knowing and diagnosing the trace elements in the components of dust from a chemical, biological and environmental point of view because of their great effect on human health in the first place and on plants, animals and soil. The study showed that the levels of trace elements are high compared to the natural rates, and that the percentages of Cl, Sr, Ba and Zn respectively are the highest among these elements in the regions of southern and central Iraq. The study concluded that dust storms are loaded with high levels of trace elements.

**Keywords:** trace chemical elements; southern in Iraq; southern in Iraq

## 1. Introduction

The chemical investigation of dust atoms is important in evaluating the prospective effects of dust on weather, atmosphere, soil and health of human, and dust-related accidents are a major issue and concern that occurs every year in the middle and Southern in some Iraq region. Dust elements has a significant impact on the chemically and physically configuration of the atmosphere, while dust deposition delivers external organically and inorganically substances to the Earth's superficial and takes a significant impact on geological, biological, chemical and environmental developments from the Earth (1,2). Stormy dust particles can affect farms and farmland, negatively affecting agricultural production. Dust deposits can have direct and indirect adversative properties on plant, animal and health of human at the area level (3). Dust from airborne contains of very fine atoms of soil and rock that rise from the earths superficial as effect of storm destruction and degradation under convinced soil and climatic environments. So, the chemically composition and physically properties of the powder are an essential element in formative the origin of the powder (4, 5). The mineral conformation of dust varies from region to region, dependent on the space from the basis region and the chemically reactions taking place in the atmosphere (6). The minerals quartz and silicates make up the majority of inorganic dust, with silica making up about 59% of the Earth. Other important components are organic matter, Fe<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub> and CaCO<sub>3</sub> (7). Chemical analysis of dust is essential to understanding the prospective environmental and health effects of dust (8). Chemical analysis of dust provides useful

information on potential health risks since trace components such as lead, nickel (Ni), (Pb), copper (Cu), arsenic (As) and cobalt (Co) (9). Dust mist atoms can also source rise in respiratory diseases and damage of lung as particles contain sulfur composites and silicon metals. Particles of dust less than 10 µm in diameter (= PM<sub>10</sub>) have been associated with COPD and asthma. Particles as small as 2.5 µm (= 2.5 µm) can reason harms such as cardiovascular illness in children and youngsters if unprotected to >5 µg/m<sup>3</sup> intended for longer stages of time. Several studies have shown that PM<sub>10</sub> and PM 2.5 levels can cause premature death and respiratory problems (10). X-ray spectrometry (XRF) has become an important non-destructive analysis method in educational custom research, mostly due to its non-invasive nature and capability to quickly determine elemental conformation. Because X-rays can penetrate materials deeper than visible light, they allow for more detailed analysis, which could eventually lead to a conclusion about the substrate (11). Meanwhile soil is a not able to be renewed resource, its pollution is very important as sediments can spread to new parts of the atmosphere such as surface, air and water held underground in the soil (12, 13, 14). One of the reasons that lead to an increase in the concentrations of mineral substances in the soil is the development in the field of agriculture and industry (15). In the environment, heavy metals are highly toxic and dangerous pollutants due to its biological nature, it is unable to decompose (16). It tends to mount up in biotic systems with severe magnitudes (17, 18). The wind factor and sewage methods are one of the important means for the transmission of mineral pollutants in the soil, which leads to the accumulation of these metals (19). Also, these soil polluting minerals can be

transferred through fertilized crops to the human food chain in addition, the increase of heavy metals in agricultural soils limits or reduces the yield (20). The results of the HYSPLIT feedback air parcel analysis indicated that the likely sources of dust storms are the North African desert, the Syrian desert, the Nefud desert in Saudi Arabia, southwest Iran, the mud and arid regions of southwest Turkey, the Jazeera plains and the western deserts of Iraq (21). In recent years, dust activity has become a serious environmental problem in Iraq (22). It is possible that the facts of Iraq appear in the windswept bottoms of dry lakes, rewards and semi-deserts in Iraq and neighboring nations (23). Iraq covers vast sandy deserts (about 40% of the overall region of Iraq) and is the foremost basis of dusty airborne in the Middle East (24). Desertification in Iraq has intensified since 1990 due to severe drought, construction of dams in neighboring countries, and the unstable political situation leads to hostilities, as well as the repercussions of war, land abuse and deforestation (25, 26). The particles can affect farms and farmland and negatively affect agricultural production. Dust accumulation can have a direct and indirect negative impact on the health of plants, animals and humans at the regional level (27). Dust events have become more frequent in Iraq due to severe drought in the last decade (28). The deserts of Syria, Jordan, Arabia and North Africa (the Sahara) are other important sources of dust storms affecting different parts of Iraq (29). Prolonged droughts, water scarcity and

significant changes in rainfall data have been reported on a local gauge in Kuwait, Iran (30, 31, and 32) and in Iraq (33).

## 2. Materials and Methods

The study dust sample was collected during the occurrence of sandstorms in the summer and spring seasons in Iraq from the governorates of central and southern Iraq, with an average of three models for each governorate, and these governorates are Babylon, AL-Diwaniyah, Kerbala, AL-Najaf and AL-Muthanna.

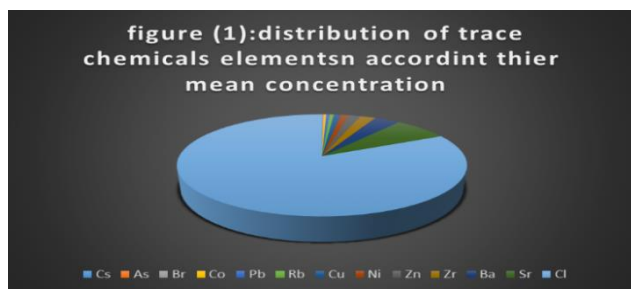
The study included 15 dust samples collected in glass containers and placed in open places far from the movement of people. The glass container measures 2 \* 2 meters at a height of 2.5 meters from the surface of the ground for 2-3 days during a dust storm. Sieve all samples using a sieve with holes of 2 mm for the purpose of removing any impurities or foreign pieces, then the samples are dried at a temperature of 60 ° C and then crushed by an aluminum mill.

We mix 5 grams of each sample with polyvinyl alcohol and put it in a special aluminum tube and press with a force of 2000 pounds / inch and then dry the sample at a temperature of 60 degrees Celsius until it is now ready to analyze the trace elements in the dust using X-ray fluorescence spectrometry (XRF).

## 3. Results

Table (1): The chemically trace elements in storm dust in some region in Iraq.

Elements NO.		Kerbala	AL-Muthanna	AL-diwanিয়া	AL-najaf	Babylon	mean
1	Cs	4.33	3.33	2.33	3.66	3	3.33
2	As	5.33	3.66	2.33	4.33	3.33	3.8
3	Br	7.66	4.66	3.33	7	12.33	7
4	Co	28	23.66	10.66	28.33	10	20.13
5	Pb	42.33	23.33	18	36.66	23	28.66
6	Rb	43	36.33	26.33	35.33	23.33	32.86
7	Cu	71	63	33.66	74.66	41.33	56.73
8	Ni	92.33	41.33	32	91	57.33	62.8
9	Zn	33.33	32.66	17.66	132.33	262	95.6
10	Zr	154.33	124	88.33	148	94.66	121.86
11	Ba	252.33	228.33	122	242.66	186.33	206.33
12	Sr	582.33	443.66	196.66	495	472.66	438.06
13	Cl	5745.5	5773	2434	7535.5	3350	4967.6



## 4. Discussion

Dust storms carry metallic aerosol, can travel around the world and have a significant impact on global climate and environment (34, 35). Identification of aerosol mineral deposits can also be useful in

determining their sources (36, 37). Metal particles carried by aerosols are usually heterogeneous, but they are often considered as a comparatively homogeneous group, which may increase improbability in models of chemistry in atmosphere (39). Consequently, educating our information of the mineralogy of airborne elements is a major challenge for scientists of atmosphere.

The outcomes of chemically analysis showed that the most important trace components contained in air dust revealed high mean of Cl, Sr, Ba, Zr and Zn which coordinated with (21) who founded high mean of trace elements in some region in Iraq. The result showed the mean of Cl is highest among other trace element which agreement with (39). Soil has a significant impact on human health, either positively

or negatively, directly or indirectly. Soil remains the main source for the production of food and medicine, such as the production of antibiotics. Therefore, the nutritional imbalance in addition to the pathogens in the biological environment of the soil can have adverse health effects. Due to both environmental conditions and human activities, there are many places in the soil anywhere numerous components or chemical compounds are present in contaminated concentrations (40). When glycosylated cells suffer from chlorine salinity, chlorine concentrations in tissues can exceed their needs and lead to their toxicity. Symptoms of visible chlorine poisoning usually begin with accompanying discoloration that progresses to necrotic lesions and leads to symptoms of leaf tip burn (41, 42). The high percentage of chloride salts is due to the high level of groundwater in the region, in addition to factors of desertion and scarcity. It is illustrious that the chloride contented in greatest places exceeds the permitted value of 0.1%, which affects the technical behavior of the soil, and is also dangerous for foundations and reinforcements. Increasing the chloride content reduces the limits of Atterberg and increases the maximum rate of the dry concentration, and this affects the compressive strength possessions of concrete, as its strength reductions with the increase in the chloride content, especially at the beginning of the concrete life (39). Airborne dust often contains heavy metals due to refineries, power plants, vehicles, urban structures, and some other sources of pollution that may expose people to heavy metals. Toxic by inhalation, hand-to-mouth and skin contact. It can have adverse long-term health effects (43, 44, and 45). Our result revealed high concentration of trace chemicals elements these coordinated with trainings have shown that urban dust comprises important heavy metals such as cadmium, copper, lead and zinc, which are highly affected by human activities (46). Sources of heavy metals such as copper, zinc and lead in urban environments have been mainly affected by vehicle and petrochemical plant exhaust emissions (47). In adding, consume fossil fuel and gases burning can be considered as atmospheric causes of nickel and zinc (48, 49, 50).

The present study result showed the outcome vary indifferent region this may be dust from airborne contains of very fine elements of soil and/or rock that rise from the earth's superficial as a consequence of airstream attrition and degradation under convinced soil and climatic environments. Therefore, the chemically composition of dust is an important factor in limiting the regions from which dust originates (51, 52). In some cases, by examining the mineral components in the clay that are present in dust particles for the purpose of knowing the sources of dust storms (53). The minerals in the dust depend on the type of soil in the area of origin and the way it decomposes. Mineralogy from dust sections can assistance make known the main sources of dust in the sedimentary and dry grasslands of Iraq and the

Middle East. The basis of the dust can be described by determining the mineral composition of the dust and the paths of the air masses (54). Also the mineral conformation of the dust varies from some region to another dependent on the expanse from the basis area and the chemically reactions taking place in the atmosphere (55), and the geochemical and geological properties of mineral dust have been studied in diverse areas. In different parts of the biosphere, there are insufficient available studies on the mineral and chemical possessions of dusty storms in Iraq (56, 57). Dusty Mineral is an important influence in fog creation and the Earth's radiation equilibrium. Its character depends on the involvement processes within the atmosphere, residence time, regions of dust origin, particle size distribution, and diverse chemically and physically environments of the air (58). Many airborne dust contaminants (pesticides) affect community health when these contaminants are transported through human settlements. Chemically analysis of dust is necessary to understand the prospective impact of dust on the atmosphere, soil and healthiness (59, 60, and 61).

## 5. Conclusion

The study concluded that it is very important to study the chemical properties of dust resulting from dust storms, which have taken place abnormally in Iraq during recent years. The study found a significant increase in the rate of trace elements above the normal level and that this rise may have an undesirable effect on human and animal health as well as the great impact on the chemistry of the soil.

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