THE DUST – CHEMICAL INDICATOR OF ENVIRONMENT POLLUTION

Elena GAVRILESCU[1], B.F. GAVRILESCU[2]

[1]University of Craiova
e-mail: gavrilescu_elena@yahoo.com

[2]Direcţia Apelor Jiu, S.G.A. Dolj
e-mail: gavrilescubogdan@rdslink.ro

Dust is a general name for minute solid particles with diameters less than 500 micrometers. On Earth, dust occurs in the atmosphere from various sources; soil dust lifted up by wind, volcanic eruptions, and pollution are some examples. Airborne dust is considered an aerosol and can have a strong local radiative forcing on the atmosphere and significant effects on climate. In addition, if enough of the minute particles are dispersed within the air in a given area (such as flour or coal dust), under certain circumstances can be an explosion hazard.

The dust can be an indicator of environment pollution, especially of inside air. This is a heterogeneous mix, composed from organic and inorganic particles and other chemical material. Dust in homes, offices, and other human environments is mainly generated by the inhabitants (especially domesticated pets such as dogs, cats and birds), and mainly from their skin cells that slough off. Some atmospheric dust from the outdoors is also present. On average, approximately 6 mg/m^2/day of house dust is formed in private households, depending primarily on the amount of time spent at home.

This study base on negative impact of daily exposure in contact with the chemical compounds of the dust and, also, it refers to the danger represented for the population health.

The research was carried out in Tg-Jiu municipality in three crossroads with different pollution degree of trafic: high, medium and low. It was performed analysis of $PM_{2,5}$ mg/m^3 concentration and heavy metals contenue, at different hourly intervals, both in the street dust and also in the household dust.

It was resulted that Hg with Cr, As and Mn are present in the street dust, althought in househol dust appear just Hg.

***Keywords**: dust, chemical indicator, environment pollution, chemical compounds, heavy metals.*

The continous growth of human population and, implicit, of their material and energetic needs leads to higher and higher disturbance of energetic flux. The scientific discussions regarding and future of antroposphere are dominating inter alia by concepts like environment quality and pollution. The knowledge about the pollution forms and their effects on the ecosystems represent an obligatorily condition and an exigence for the quality environment assurance and population health.

This study represent an essential problem of society and, also, of the environment recovery, conservation and harbour.

One of the general principles of environment protection strategy is represented by the conservation of people health condition, that being the supreme principle to which must being subordinated the whole economic and social activity. Hereby, we focus on the dust pollution.

The dust, according to provenience can be classified in three categories: airborne dust, fugitive dust and household dust.

The fugitive dust is a very interesting component of ambient air, which results from the unpavement roads (40%), different sources (19%), natural sources (17%), constructions (13%), pavement roads (8%) and other sources (3%).

The household dust is composed by the fine particles of skin, hair, wax, pollen, mould, wood, nylon, paint etc., but also from some chemical content with different harmful degree: toxic metals (Pb, Cd, Hg, As, Cr), pesticides, alchylphenols, bromate compounds, organostanic compounds, phthalic ethers, chlorided paraffin with short catena.

Daily we are exposed to these chemical compounds and to the danger represented for the healthy. Thus, the alchylphenols induce hormonal disturbances; the phtalic esters – reproduction system disturbances; the bromated compounds – endocrine malfunction and the chlorinate paraffin provoke carcinogenesis.

The mainly sources of household dust are the simple activity like walking or use of chamber furniture, the aspiration or cleaning process of the dust, the painting, the dancing etc.

Some construction materials like concrete or cement represent another source of fine matter particles; these could emit material particles inside of buildings in a period of two years from the found.

Household dust contains many heavy metals, their concentration being bigger than usual level from street dust, this fact being highlight also by a research achieved by Kettles and Shilts in Ottawa city (1994).

Table 1

Heavy metals concentration, mg/kg, from household dust and their usual level

Metal	Street dust	Household dust	Usual level
	n=45	n=48	n>1780
Ag	0.2	4.5	0.3
As	2	13	8
Cd	0.6	15.3	0.4
Co	11	12	38
Cr	59	157	105
Cu	188	382	205
Fe	25950	19120	69000
Hg	0.06	6.57	0.22
Mn	534	366	1350
Mo	2	4	6
Ni	19	103	86
Pb	68	969	28
U	1	0.9	5.7
Zn	184	1226	220

MATERIAL AND METHOD

The research was carried out in 2006, in Tg.-Jiu town and was focus on three big crossroads differently polluted according to the traffic, meaning: the crossroad of Republicii Avenue with Calea Unirii Avenue – high traffic; the crossroad of Calea Unirii Avenue with Victoriei Avenue – medium traffic; the crossroad of Ana Ipătescu Street with Calea Bucureşti Avenue – low traffic (*fig. 1*).

Figure 1. **Tg.-Jiu municipality map**

In these location have been determinate the $PM_{2,5}$ □g/m^3 outside and inside of living homes. Also, has been analyzed the heavy metals, represented by hydrargyrum, zirconium, chrome, arsenic and manganese.

As we know, the industrial processes and the traffic are responsible for the presence of heavy metals in ambient air, their concentration depending by the size of dust particles.

According with the above discussion, we carried out a research using latest instruments: digital portable apparatus Olhram for noxe determination and a fluorescence spectrometer with X ray.

RESULTS AND DISCUSSIONS

The concentration variation of $PM_{2,5}$ □g/m^3 measured at different hourly intervals is represented in *fig. 2, 3*, observing a higher content of outside dust in Republicii Avenue area, between the hours 2^{00}-4^{00} and 7^{00}-9^{00}. Significant variations were noticed in Calea Unirii crossroad between the hours 14^{00}- 16^{00} and 21^{00}-23^{00}. Also, in Ana Ipătescu Street, between the hours 2^{00}-4^{00}, were registered the lower values relative to the rest of locations.

Inside of living homes, the maximum concentrations were recorded between the hours 14^{00}-17^{00}.

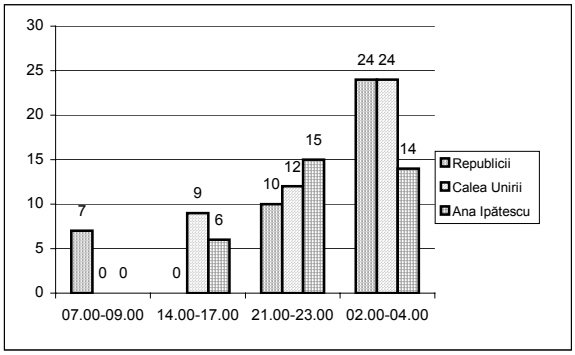

Figure 2. **Concentration variation of PM2.5, mg/m^3, outside, at different hourly intervals**

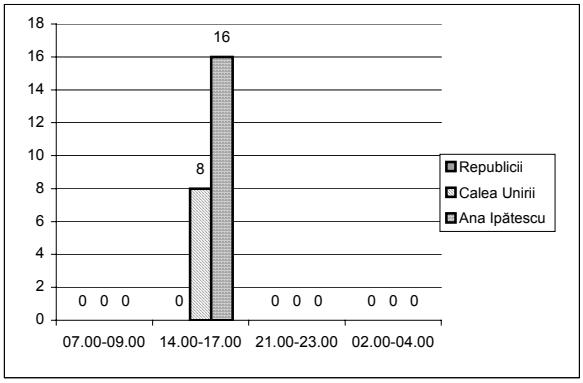

Figure 3. **Concentration variation of PM2.5, mg/m^3, inside, at different hourly intervals**

The heavy metals concentration variation presented in street dust and household dust is represented in *fig. 4, 5, 6*. Thus, the hydrargyrum was the metal with the higher concentration in all sampling point. The zirconium presented the lower concentration. In Republicii Avenua are, the hydrargyrum and chrome pollution is relative higher, especially in airborne dust. In Calea Unirii are, the higher concentration were registered for arsenic and manganese elements. In the crossraods of Ana Ipătescu with Calea Unirii were highlighted higher values of hydrargyrum and chrome concentrations.

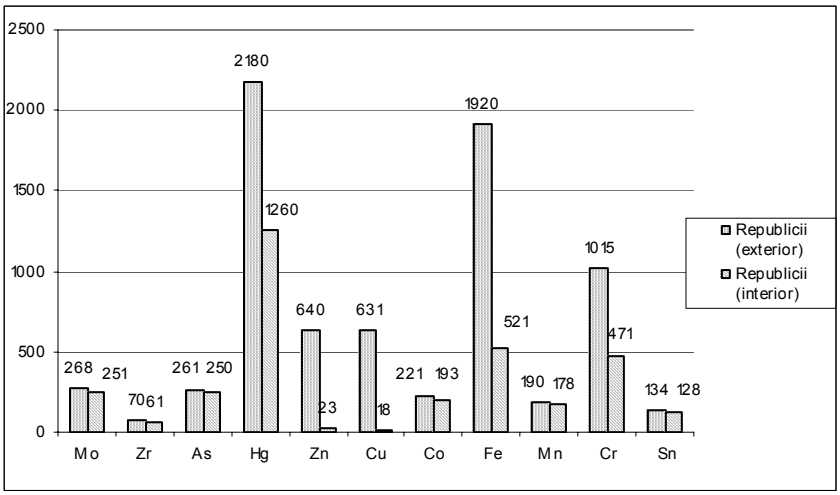

Figure 4. **The heavy metals concentration variation present in street dust and household dust, Republicii Avenue**

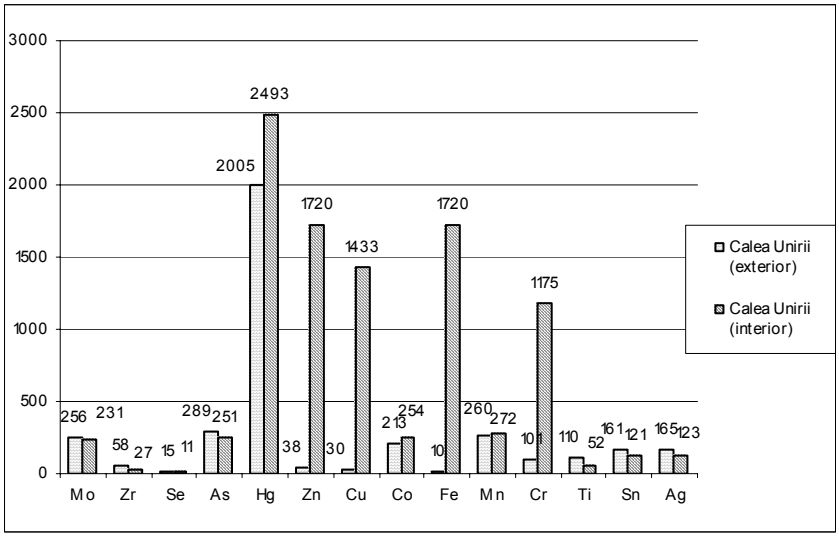

Figure 5. **The heavy metals concentration variation present in street and household dust, Calea Unirii**

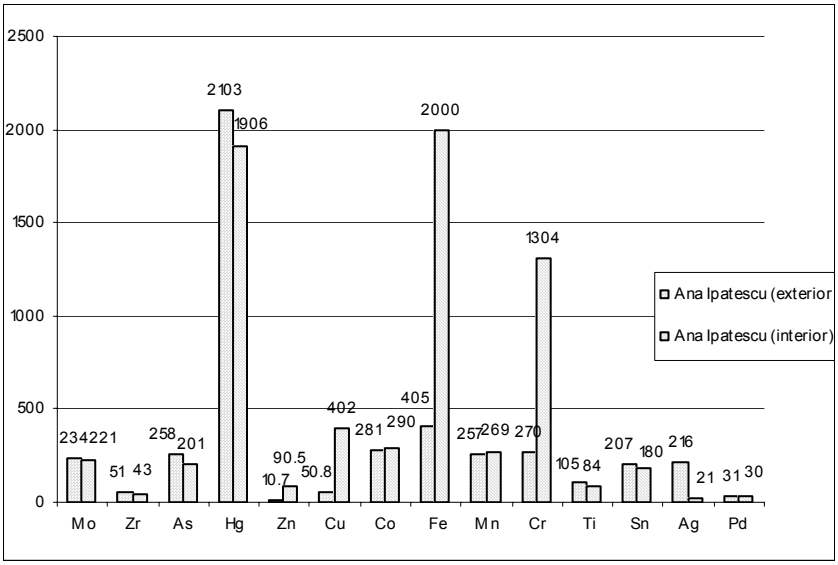

Figure 6. **The heavy metals concentration variation present in street and household dust, Str. Ana Ipatescu**

CONCLUSIONS

The household dust is polluted with a large variety of dangerous chemicals rise from everything that composed the inside of a house, including the ones belonging.

The continuous exposure at the inhalation, ingestion or direct contact of skin with the dust represents a maximum risk of children diseases.

In 1998, by OSPAR Convention was establish the elimination from the market products of dangerous chemicals from the classes: ignifug bromate compounds, phenols-aldehyde, chlorided paraffine, organostanic and uniphthalate compounds, these following to eliminating till 2020.

In Tg.-Jiu crossroads carried out, the hydrargyrum was the metals with the higher concentrations, both in outside and inside of living homes.

The heavy metals majority presented in street dust was enlisted higher values in autumn season than in the winter season.

Except the hydrargyrum, another highlighted metal is chrome, higher values in outside air presenting the arsenic and manganese.

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