

Секция 10

ENVIRONMENTAL ISSUES AND SUSTAINABLE DEVELOPMENT

PETROCHEMICAL INDUSTRY AS A SOURCE OF PARTICULAR MATTER AND THEIR INFLUENCE ON HUMAN HEALTH

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Nowadays, there is a serious problem of anthropogenic pollution. The air is exposed to petrochemical industry effect that is the one of the main sources of the aerosol pollution. This type of plants produces various solid particles that are emitted into the atmosphere and cause environmental problems and human diseases. Aerosols provide climate changes and transform chemical and physics properties of the air. There are many research works that give us reasons to control the quality of the air, to protect people from negative influence of aerosol pollution.

Aerosols are formations of tiny particles which are contained in gases [2]. There are many kinds of aerosols with different composition, size and shape of particles. They can exist as a stable suspension for a long time and are little influenced by gravity force. Particle clouds can change their properties while moving: new particles can form, and existing particles can grow or shrink. These processes influence their behavior and stability. Measure of particles is determined by total suspended particles (TSP) [3]. There are two types of particulate matter - fine (PM_{2.5}) and coarse (PM_{10-2.5}). These particles have a negative impact on human health. Coarse particles with the diameter of more than 10 mm do not pose a danger, because they can be expelled from nasal-pharyngeal organs. On the contrary, fine particles are able to penetrate deeply into the lungs and adversely affect human health.

There are two types of aerosol particles source: natural and anthropogenic [6]. The goal of the paper is to consider the second type, i.e. the anthropogenic source. Of course, there are particle concentration limits which regulate air emissions [2]. Nevertheless, densely populated areas usually suffer from air pollution which is in particular caused by petrochemical and refinery industries. The content of certain elements in the air provokes many human diseases such as lung cancer, heart diseases, acute respiratory infections, and chronic bronchitis, asthmatic attacks, etc [3]. There is a special classification of risks induced by particular matter. They are divided into carcinogenic and non-carcinogenic risks. The carcinogenic risk is a hazard of development of any type of cancer. The acceptable or tolerable risk is $1 \times 10^{-6} - 1 \times 10^{-4}$. The non-carcinogenic effects are of no significance if HI (Hazard Index) is below one chemical. There is a list of the carcinogenic elements made by IARC (International Agency for Research on Cancer) that includes As, Be, Ca, Cr, Ni, Ra, etc [1].

Government should control the atmospheric emission and it does in the some countries, such as Europe and North America [5]. Unfortunately, such a situation is not everywhere, and air condition of many countries is out of control. Research works show that the most common elements in PM of petrochemical industry are Zn, Pb, Cd, Co, As, Cu, Cr, Ni, Mn [3, 5]. China is one of the countries which is contaminated by air particulates [3]. For example, in Nanjing, capital of Jiangsu Province, this kind of industry causes an increase of toxic elements in aerosols. The health of local population is in risk,

because people can contact with harmful elements by inhalation, dermal contact and ingestion. Children are more sensitive for toxic metals than adults, because aerosols particles can easy penetrate into their organism through hand-to-mouth activities [4]. Besides, their digestion system has a high rate of absorption.

In the research air samples from two areas of Nanjing – Gulou (center district) and Pukou (suburb) were used [3]. The research shows that the average mass concentration of PM 2.5 to TSP in Gulou is 0.61, while in Pukou this concentration is 0.50. The most common elements in TSP and PM2.5 are Zn, Pb, Mn and Cu. The carcinogenic risks of As, Cd, Co, Cr, Ni by inhalation exposure have an acceptable value for children ($< 1 \times 10^{-4}$). The HQ (Hazard Quotient) values for Mn in TSP and Co in PM2.5 are beyond the safe level ($=1$), therefore, children are under non-carcinogenic risk via inhalation exposure. The carcinogenic risks from dermal contact with As, Cr and Pb in both TSP and PM2.5 are within the acceptable level ($< 1 \times 10^{-4}$). However, some elements, such as Cr may cause non-carcinogenic risks to children, because HI values for TSP and PM2.5 are higher than the save level ($=1$). Health risk via ingestion exposure posed by As and Cr to TSP and PM2.5 is acceptable for children. The non-carcinogenic risks of Pb, As and Co from PM2.5 are higher than them from TSP.

Anthropogenic activity always influences the environment and the human health. Aerosol pollution in Nanjing proves it and there are many other examples around the world. Government should pay more attention to this problem and try to regulate atmospheric emission.

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