CREATION OF POWERFUL HIGH-EFFICIENCY UV RADIATION SOURCES AND THEIR APPLICATION FOR DISINFECTION AND PURIFICATION OF WATER AND AIR [[1]](#footnote-1)\*)

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UV radiation is effective for disinfection of water, air and surfaces, as well as for photochemical reactions in air and water. This method is environmentally safe, efficient, simple and cheap to operate. The most effective source of bactericidal UV radiation is an electric discharge in low-pressure mercury vapor, which emits a mercury atom line with a wavelength of 254 nm, located near the maximum of the bactericidal efficiency curve. The need to disinfect water at great expense led to the creation of powerful effective amalgam lamps. Developed heavy-duty (500 W and above) high-efficiency amalgam lamps of low pressure and a power supply to them with a high (40%) The efficiency of converting electrical energy into bactericidal UV radiation at a wavelength of 254 nm, with a high working life of 12,000 hours with a decrease in UV radiation power of only 15%. To create them, it was necessary to solve a number of scientific problems related to increasing efficiency, working life, protecting walls from the effects of electric discharge plasma, destroying electrodes, and creating power sources.

A promising method of air purification from odors and harmful substances is the photo-sorption-catalytic method. The purified air is treated with ultraviolet radiation with a wavelength of 185 and 254 nm, which leads to the formation of active particles, OH radical, atomic oxygen O, ozone O3, etc. Oxidation and transformation processes occur first in the bulk part of the photoreactor, then air is supplied to the sorption-catalytic stage, where the under-oxidized components are adsorbed and re-oxidized in slower processes by active particles from the gas phase, as well as air oxygen. This combination of methods and processes allows for a high degree of purification in the presence of a wide range of impurities, such as hydrogen sulfide, mercaptans, ammonia, volatile organic compounds, etc. A kinetic model of chemical reactions for the removal of hydrogen sulfide and formaldehyde was developed, including 54 reactions, and calculations were carried out on the basis of which installations for removing odors from the air were designed and manufactured. Numerical modeling indicates the important role of the presence of water vapor in the reacting gas. Photooxidation of hydrogen sulfide and methanal impurities practically does not occur in dry air. This is explained by the fact that in the absence of water molecules in the gas mixture, active hydroxyl radicals (OH) cannot be formed in the photoreaction. It is the OH radicals that play the main role in initiating the initial stage of oxidation of these impurities. For this equipment, amalgam UV lamps with increased power of 620 W and with high UV radiation output of 185 nm - 60 W and 254 nm -200 W were developed. In a rectangular flow photoreactor with a cross section of 176 x 220.6 cm and a length of 160 cm, 24 UV lamps with a power of 620 W each are installed perpendicular to the air flow with a flow rate of 5000 cubic meters/ hour. Next, the air flow passes through a catalytic block with activated carbon filling. The purification efficiency was 98.5-99.9% with a hydrogen sulfide concentration at the inlet from 10 to 80 mg/cubic meter.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/R/ru/KW-Vasilyak.docx) [↑](#footnote-ref-1)