SOME PECULIARITIES OF APPLICATION OF CLUSTER IONS GENERATED BY PLASMA IN RESPECT OF INDOOR AIR PURIFICATION

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Environmental contamination with microorganisms is a very important issue to be solved. It is recognized that airborne microorganisms can cause a wide spectrum of illnesses in humans, ranging from allergic illnesses to invasive diseases. Most of the conventional methods use the power of a fan to draw in air and pass it through a filter. Recently, the SHARP Corporation, Japan, has developed the world's first "Plasma Cluster Ions (PCI)" air purification technology using plasma discharge to generate cluster ions. The new plasma cluster device releases positive and negative ions into the air, which are able to decompose and deactivate harmful airborne substances by chemical reactions. Because cluster ions consist of positive and negative ions that normally exist in the natural world, they are completely harmless and safe to humans. The amount of ozone generated by cluster ions is less than 0.01 ppm, which is significantly less than the 0.05-ppm standard for industrial operations and consumer electronics. This amount, thus, has no harming effects whatsoever on the human body. But particular properties and chemical processes in PCI treatment are still under study. It has been shown that PCI in most cases show strongly pronounced irreversible killing effects in respect of airborne microflora due to free-radical induced reactions and can be considered as a potent technology to disinfect both home, medical and industrial appliances.

As for any novel technology, it was necessary to study the mechanisms of action, relative effectiveness, safety rules and some peculiarities in practical applications. Thus, our tasks were to determine particular targets of PCIs in cells, species-to-species variations in resistance, the most potent PCI exposure time (time- and dose-dependent experiments) and some characteristics of power supply. These data will be presented during our talk. Also we will show the spatial distribution of PCI efficacy using both direct methods based on a portable ion detector and indirect methods observing inhibitory effects on indicator microorganisms. According to our data, most of the PCIs are emitted towards the front and front-downward directions. Thus, there are pretty heavy ion clusters emitted showing an initial momentum and a relatively short lifetime. Based on these data it will be possible to develop more effective, predictable, and safer air cleaning systems in future.