

DEVELOPMENT OF AN EDUCATIONAL AND OPERATIONAL STAND OF A FILTERING AND ABSORBING UNIT ON AUTOMOTIVE EQUIPMENT THAT PROVIDES NEUTRALIZATION OF HAZARDOUS CHEMICALS

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Russia's war against Ukraine has created a dangerous precedent. A state that had renounced its nuclear arsenal in exchange for security guarantees was attacked by a nuclear state that was one of the guarantors of its security. Russia's ability to use nuclear coercion to support its unprovoked aggression has become a negative showcase for potential proliferators, leading to a deadlock in previously existing non-proliferation practices.

On April 5, 2022, as a result of artillery shelling by Russian units of the settlement of Rubizhne, a 60-ton railway tank with nitric acid was hit, resulting in a release into the air. The wind direction was northeast, which contributed to the spread of the cloud towards the temporarily occupied territories. Subsequently, Russia and the so-called LNR/DNR accused Ukraine of terrorism.

Having analyzed literary sources, it has been established that in collective protection systems, it is possible to improve operational characteristics without significant design changes and significant material costs by additionally installing a mesh with a layer of catalytic material in the filter absorber. This will make it possible to neutralize (decompose) toxins of various nature with high performance indicators in a wide range of temperatures and corrosion resistance.

The optimal method for air purification from HWM is photocatalytic air purification, where titanium oxide is used as a photocatalyst, which is capable of effectively neutralizing (decomposing) toxins of various nature with high performance indicators in a wide range of temperatures.

A titanium (IV) oxide mesh with a layer of catalytic material applied and LEDs are placed in an iron metal tube 1000 mm long. The diameter of the TiO_2 mesh with a layer of catalytic material applied is 300 mm, the diameter of the hole in the mesh is 2 mm. LEDs are placed in two identical halves of the tube at the same distance from each other. The wavelength of ultraviolet light emitted by the LEDs is 280-400 nm, the scattering angle is 60° .

In the purification system, titanium oxide, when absorbing a light quantum with an energy of more than 3.2 eV (this is light with a wavelength of less than 390 nm - ultraviolet), generates free charge carriers - negative electrons and positive vacancies (holes). Electrons and holes, coming to the surface of TiO_2 , enter into redox reactions with oxygen and water vapor of air or water.

The implementation of these retrofitting measures for filter ventilation units on armored vehicles and stationary structures will make it possible to protect personnel from hazardous chemicals.

References:

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