

MODERN SUBSTANCES FOR IR SMOKE SCREENING

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Development of reconnaissance equipment is a reason why aerosol screening plays an important role in modern warfare. The increasing frequency of use of high-sensitivity forward-looking infrared devices at battlefields causes the necessity to use smoke which is opaque to infrared (IR) radiation.

The main purpose of the present research is the analysis of substances used for IR obscuring. A variety of the substances employed for IR screening was also investigated.

It was found out that phosphorus (both white and red), hexachloroethane, hexachlorobenzene, brass and terephthalic acid are presently used as substances for IR-opaque smokes to screen military activities. But these substances have some undesirable properties such as a short shelf life, toxicity and ecological risks as well as high burn temperatures.

When combusted in the air, phosphorus is oxidized to phosphorus pentoxide, which then reacts with water to form droplets of orthophosphoric acid, that is strong skin and respiratory irritant. Also white phosphorus is highly corrosive substance, it has pyrophoric properties and is difficult to extinguish. Red phosphorus is more stable than white phosphorus, and it is non-toxic. Over time, however, it can slowly react with moisture and oxygen to form toxic pyrophoric gas phosphine.

Hexachloroethane and hexachlorobenzene mixtures with metal compounds can cause gross pathological pulmonary injuries and even death in severe cases.

Brass is non-toxic for humans but high concentrations of its flakes may cause functional changes as well as ocular and pulmonary irritation in animals.

Despite the fact the terephthalic acid is safe, its smoke mixtures have poorer masking properties in comparison with above mentioned compositions.

Therefore, considering all the properties, it is proposed to use graphite and graphite-based compositions for IR aerosol masking due to its low price, low chemical reactivity, non-toxicity and being environmentally benign.

References:

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