

## MITIGATION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL HAZARD MITIGATION

### On-site And On-demand Production Of Decontaminant Using Plasma Reactor

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Current decontamination systems are limited by the need to stockpile large quantities of decontaminants and low compatibility with equipment, which hindering rapid operation and the remediation of contaminated areas. Therefore, in line with the concept of the future chemical and biological decontamination, there is a need to develop decontamination system which could reduce the stocked chemicals and exhibit good compatibility with urban areas, ports, airports and advanced equipment.

We have been developing technology for on-site and on-demand production of decontaminants using a plasma reactor. Plasma discharge with air can generate reactive oxygen and nitrogen species in gas phase, and these reactive species are dissolved into the water, resulting in formation of decontaminant. The generated radicals are converted into stable chemicals such as hydrogen peroxide, ozone, peroxyxynitrite, nitrite and nitrate. Initial screening of reactive species toward decontamination efficacy of biological and chemical agent is conducted, and those down-selected are evaluated in terms of efficacy, shelf life, possibility of generation. Also, we aim to increase the concentration of reactive species and production rate of decontaminants. The plasma generator and gas-liquid mixer are main modules to determine the performance of plasma reactor. Microwave induced plasma is optimized for on-site generation and hollow fiber-based membrane contactor is developed for improved transfer rate between gas and liquid owing to its high interfacial area. This system would be suitable for future decontamination systems, offering environmental friendliness and automation in decontamination process.

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