

MITIGATION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL CONTAMINATION MITIGATION

Durable Self-decontaminating Solgel Coatings

Charles Carfagna, Jr. Luna Labs USA **Rebecca Martin** Luna Labs USA **Ben Pinkston** Luna Labs USA **Zak Bear** Luna Labs USA
Kelsi Smith Luna Labs USA

Given the pandemic caused by the outbreak of coronavirus (COVID-19) and the persistent threat of chemical and biological (CB) warfare to deployed U.S forces, the need for active decontamination methods to neutralize CB threats is at an all-time high. Decontamination comprises the removal or neutralization of chemical and biological hazards, thus rapidly restoring the combat effectiveness of equipment and personnel. Current military decontamination efforts are labor and resource intensive, requiring excessive amounts of water, use corrosive and/or toxic materials, and are not environmentally safe. Consequently, current research and development trends focus on developing decontamination systems that overcome these limitations while decontaminating a broad spectrum of CB threats. The ideal approach would be surfaces that can rapidly self-decontaminate harmful agents upon contact, however there are currently no commercially available products that offer the durability and activity required for long-term protection. Therefore, there is a need for novel coating systems that actively decontaminate at the surface, and maintain this activity despite standard wear and environmental exposure.

Luna Labs USA proposes to leverage our established Gentoo™ solgel coating platform to create a robust, inorganic, multi-functional, and self-decontaminating surface coating. Towards this, Luna Labs has developed self-decontaminating, surface-directed, crosslinkable chemistries to incorporate into the Gentoo matrix to impart the active self-decontamination at the coating surface. Additionally, the developed solgel coating is thin (2-8 μm), low cost (cents/ ft^2), and easy to apply while providing excellent abrasion durability and barrier properties. The coating chemistry is based on a hybrid polymer-inorganic silane with demonstrated excellent adhesion to metals, plastics, and glass and is easily applied to any surface by brush, dip, or spray. Combining this technology with Luna's self-decontaminating chemistries platform, the proposed coating technology is durable, and provides active kill of bacteria, fungal spores, and viruses at the surface by >99%, while exhibiting the necessary chemical resistance and fluid repellency during a multi-year lifetime of sustained use with limited replenishment of the functional surface.

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