PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Next Generation Tactile Cbrn Gloves Via Polymer Mixed Matrix Composite

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The proliferation of weapons of mass destruction presents a serious security threat to U.S. and allied personnel around the world. Military warfighters and first responders must be prepared to operate under a wide range of chemical, biological, radiological, and nuclear (CBRN) environments while having the capacity to rapidly respond to these potential threats. Current CBRN gloves offer excellent durability and protection from CBRN threats, however they are bulky, resulting in poor dexterity and elevated thermal burden. CBRN protective gloves offer a first line of defense for personnel to perform tasks in high-risk environments. As such, the tactility of these gloves must be improved to ensure optimal utility during the assessment, extrication, rescue, decontamination, and treatment at sites where CBRN terrorism agents (both liquid and vapor) may have been deployed. Due to the use of thick butyl rubber (up to 24 mil thick), current CBRN gloves prevent the type of fine motor movement necessary to perform deft tasks during critical activities. Furthermore, with the increased prevalence of capacitive-based touch screen systems, the current butyl CBRN gloves do not offer touch screen capability. Thus, there is a need for novel barrier materials for gloves that allow for high levels of function, without the trade-off between chemical protection, dexterity, tactility, or thermal burden.

Luna Labs has developed an elastomeric mixed matrix composite (MMC) glove material with exceptional chemical resistance and improved mechanical properties compared with butyl rubber. When combined with Luna's low surface energy, high barrier surface treatment, the developed MMC glove material was able to withstand toluene permeation for over 16 hours, which is a substantial improvement over the 2 min toluene permeation time of butyl rubber. Similar performance was observed with tetrachlorethylene and chemical warfare agent (CWA) simulants dimethyl methylphosphonate (DMMP) and 2-chloroethyl ethyl sulfide (2-CEES). Luna's glove material also has over 3X higher moisture vapor transmission rate (MVTR), is touch screen compatible, and exhibits increased puncture resistance compared to butyl rubber. In partnership with the Textile Protection and Comfort Center (TPACC) at North Carolina State University (NCSU), full scale glove prototypes will be designed, developed, tested, and delivered by the end of the Phase II using accepted glove manufacturing methods. Luna Labs' highly protective, dexterous, and touch-screen compatible glove technology will be valuable for the warfighter and CBRN first responders who require accuracy and precision to perform in high-risk environments.

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