PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Luna Labs' Next Generation, PFAS-free Class I CBRN Gloves

Brady Hall Luna Labs, LLC **Ashley Mullins** Luna Labs USA, LLC **Zak Bear** Luna Labs USA, LLC **Luis Velazquez** Luna Labs USA, LLC **Bryan Koene** Luna Labs USA, LLC **Marc Mathews** North Carolina State University, Wilson College of Textiles

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. While the Class I protective equipment currently employed by warfighters offers excellent durability and protection from CBRN threats, they are bulky (~40 mil thick) which leads to poor dexterity and increased 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. Current CBRN gloves prevent the fine motor movement necessary to perform tasks during critical activities. Furthermore, current butyl CBRN gloves do not offer the capability to interact with touch screens. Thus, there is 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 a perfluoroalkyl substance (PFAS)-free elastomeric mixed matrix composite glove material with exceptional chemical resistance and mechanical properties compared to butyl rubber. Internal permeation testing showed >24 hour protection against toluene (challenged at 20 g/m2) compared to 5.2 hours for butyl rubber of the same thickness (25 mil). External testing confirmed that the glove developed by Luna Labs passes NFPA 1994 Class I requirements for glove materials against toxic industrial chemicals (toluene), chemical warfare agents (organophosphate and blister agent), and low vapor pressure chemicals (dimethyl sulfate). The glove is also touch screen compatible and has a ~40% reduction in thickness (25 mil) resulting in improved dexterity and decreased thermal burden over butyl rubber. These newly developed gloves offer superior chemical protection at a fraction of the thickness of the incumbent material, allowing warfighters to operate without sacrificing dexterity or tactile sensitivity.

This material is based upon work supported by the Army Futures Command: Combat Capabilities Development Command, Natick Contracting Division, Natick, MA under Contract No. W911QY22C0020.