

Protective Clothing Based on Permselective Membrane

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Abstract

The goal of this project is to develop chemical protective clothing for use by DOE decontamination and decommissioning workers that will increase worker productivity and address worker heat stress concerns - because it is cooler and more comfortable than conventional protective clothing-while maintaining protection against chemical liquids and vapors.

This objective project is to complete development of a new protective apparel material and to demonstrate its utility in field trials at DOE sites. The fabric is based on a permselective membrane that is highly permeable to water vapor but much less permeable to toxic organic vapors. In the first phase, the fabric properties were improved by modifying both the materials and the preparation procedure used to form the membrane. Production of the fabric was then scaled up, a small number of prototype suits were made, and a preliminary suit evaluation was conducted. In Phase II, the production methods were significantly improved to reduce cost and suits were produced in collaboration with the Kimberly-Clark Corporation. A use test with these suits was conducted at an International Union of Operating Engineers facility in which the suits were compared with suits made from Tyvek and a commonly used non-breathable durable garment.

The fabrics produced during this project were a significant advancement in state-of-the-art protective fabrics. The fabrics developed combine protection against vapor and liquid chemical hazards while minimizing the potential for heat stress by allowing water vapor to permeate the fabric. Preliminary wearer feedback from the use test suggests that garments produced from the novel fabric may have similar comfort properties to garments made from Tyvek with a potentially noticeable comfort improvement over the non-breathable durable garment.

The remaining activities of the project are completion of chemical permeation tests and completion of the cost-benefit analysis.

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