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Self-Sealing and Self-Decontaminating Breathable Smart Personal Protection Apparel

Mission oriented protective posture (MOPP) gear is a type of clothing worn by soldiers for protection in toxic environments. The gear prevents transport of chemical and biological agents with nonporous polymeric coatings. However, the coatings block evaporative cooling through sweating, along with conductive, convective, and radiative cooling, which places a large thermal load on the soldier. Thus, there is a need for clothing that can protect from toxic chemicals and can subsequently degrade the toxins to inert chemicals.

Researchers at ASU have developed a smart self-decontaminating and breathable fabric that self-seals into an impermeable barrier in response to contact with chemical weapon agents. Cross-linked polymers compose the overall structure of the protective clothing, creating a fence-like barrier that captures harmful chemical molecules. The protective gear is breathable under normal conditions, but upon exposure to chemical weapon agents, nanoparticles swell and form an impermeable membrane. Mixing a special type of absorbing compound with the elastomer pre-cursor prior to cross-linking can effectively degrade the harmful chemicals to non-toxic compounds. Overall, the protective apparel provides increased safety and resistance to chemicals in toxic environments.

Potential Applications

- Protective gear and clothing
- Smart apparel
- Nanofabrics and applied textiles manufacturing

Benefits and Advantages

- Self-Sealing - Nanomaterial embedded in the clothing swell to create an impermeable membrane in response to chemical weapon agents, providing resistance and protection from toxic chemical compounds
- Self-Decontaminating - Integration of decontaminating particles into the elastomer prior to polymerization allows the clothing to chemically degrade absorbed liquids depending on the particle size and distribution

For more information about the inventor(s) and their research, please see:

[Dr. Konrad Rykaczewski's directory webpage](#)

