PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Breathable Elastomers With Chemical And Biological Protection

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Current elastomeric barrier materials for individual chemical biological (CB) protection are durable and provide good resistance, but are typically bulky and associated with increased thermal burden to the user. Improved protective materials would allow significant water vapor transport to promote evaporative cooling of the body, coupled with repellency to reduce the amount of CB agent deposited on the barrier materials as well as agent resistance to any material that may still penetrate. This study has focused on a two-pronged approach for repellency and resistance. First, the use of electrospun butyl rubber was utilized to create a porous membrane that allows water vapor transport and provide superior repellency through design of the surface/membrane topology (superomniphobicity). Second, improved barrier performance was accomplished by non-covalently functionalizing the electrospun fibers with a thin composite coating of conductive polyaniline/TiO_2 nanoparticles and through the incorporation of pendant oximes which have been shown to degrade organophosphate compounds. Electrospun membranes give improved protective performance of these systems because of the greater surface area of the membrane. Current work is focused on combining and optimizing these efforts to produce a single membrane with multiple reactive technologies and assess their effectiveness. Experimental details on each of these individual efforts (topology, conductive polymers, and oximes) will be presented.