PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Real Time Analysis And Computational Models Of Cwas Penetration Through Swatches Of Various Protective Layer

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In order to improve the protection performance against chemical warfare agents(CWAs) with durability and reduced thermal burden, various materials of CBRN protective suits including outer layer, adsorption layer, membrane have been developed. Testing the penetration of CWAs through swatches of materials has been primarily conducted to evaluate the protective performance. Especially, the cumulative amount during target time have been widely reported as important parameter. However, to design and optimize the CBRN protective suits, understanding the behavior of chemicals which pass through the materials is necessary. In this study, we analyzed the penetrated amount and distribution of agent through swatches in real time using gas chromatography equipped with sampling loop and valve system. In addition, computational model was developed to validate experimental results and figure out the key parameters of protection performance in materials via COMSOL wiht 'Free & Porous Media flow' module and 'Transport of Diluted species' module. Agent penetration behavior was modeled with tetrahedral and triangular meshes, and model was completed by adjusting parameters such as physical properties of the material and concentration change due to vaporization based on the theoretical species trasport equation. This experimental and computational studies will be used to evaluate, predict and design the new materials for CBRN protective suits.