Solar Light Activated Photocatalysts and Functionalized Textiles for Self-Decontaminating Individual Protection Against Toxic Agents – "SafeCoat"

Nikolaus Schneider, Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS)

Photocatalysts like TiO_2 have the ability to degrade chemical and biological pollutants to non-toxic products in the presence of light (sun or UV) and oxygen. Applications for decontamination purposes are well known for special materials or self-decontaminating coatings and have been patented [1]. The aim of the "SafeCoat" project was the combination of photocatalytic active compounds with textile materials [2]. Protective clothing manufactured from these materials could become very useful for people working in a chemical environment like firemen, emergency medical personnel or soldiers. Such modified surfaces dispose of a latent capability for self-decontamination and could render unnecessary the supply of additional personnel, tools or systems.

The different partners in this project (funded by the German Federal Ministry of Education and Research; BMBF) did cover the whole chain of development from fixing active particles to fibers, preparing fabrics and finally manufacturing a prototype protective suit.

Our task in this project was the evaluation of the self-decontaminating properties of the different modified materials and fabrics towards CWA and other toxic chemicals. Different experimental set-ups were developed to measure the atmospheric composition during the irradiation of the modified materials, identify the intermediates formed during the reaction and determine reaction kinetics.

High detoxifying abilities could be proven, reaction mechanisms and decomposition products were identified. The modified textiles are stable and breakthrough properties are not significantly altered compared to the basic material.

However, the reaction kinetics are low and not sufficient for immediate decontamination during the mission. Therefore, at current stage, we can recommend these materials only for not time critical applications like post mission storage of contaminated protection suits or for the precautionary protection of material e.g. for tents or cover materials in mobile operations or for field camps.

[1] I. Dekany, A. Richardt, M. Busse, T.Seemann, V. Zöllmer, "Funktionslack" Functional coating comprising a coating matrix material and a composite material comprising carrier-/binder material and a functional material bound to the carrier-/binder material ; Patent DE 10 2012 219 918 A1; 30.4.2014; http://publica.fraunhofer.de/documents/N-311071.html (06-06-2017)

[2] "Textilien für den selbstdekontaminierenden Individualschutz" (Textiles for self decontamination individual protection); "Security Research - Research for Civil Security; http://www.sifo.de/de/safecoat-textilien-fuer-den-selbstdekontaminierenden-individualschutz-2198.html (06-06-2017)

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