

Some Challenges in Testing of Barrier Polymeric Materials Used for Specialists' Isolative Protection

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Introduction

Finding of material protective properties used in a scope of isolative protection has relatively long-term tradition in the Czech Republic. Barrier materials which are a base of constructive materials of isolative protective materials designed for both the Czech Armed Forces Chemical Corps and the Czech Republic Fire Brigades specialist are made from butyl-rubber polymeric mixtures double-sided coated on a polyamide folio. A basic question thus can be: Is a barrier created from butyl-rubber sufficiently suitable material for ensuring of high quality of specialists' isolative protection in current time? This question has the importance mainly at the time when the security environment has been changed and, moreover, at the time when possibilities of budgets are slightly restricted for making quick and effective changes in professionals' equipment.

Data related to the barrier: General knowledge versus measured results is not enough

If the term of barrier is employed in connection with specialists' protective isolative material it means mainly a summary of properties of material of protective garment in relationship with permeation and penetration. Both terms express breakthrough time of a chemical (a toxic chemical substance). The breakthrough time is a period of time between the cover of chemical (the toxic chemical substance) on one square centimeter of an outer side of a protective garment and making the prove of some amount of this chemical on an inner side of the garment. In this definition conception there is no mention about basic aspects of the existence of any substance of an underside of barrier material, thus its kind and a particular concentration (amount) [1,2].

From the evaluation of the barrier properties of protective garments point of view the breakthrough time is one of the crucial criteria for their assessment. The time of safe usage of the garment is not the same as breakthrough time. For example, when it is not possible to document the particular chemical (the toxic substance) after 480 minutes on inner side of the protective garment it does not yet mean that there is no penetration or permeation [3,4]. It only means that with used norm (way) of measurement influenced with the sensitivity of a device it has not been possible to evidence the permeation or penetration of the chemical. When in practice comes to cover of the chemical on the area of the material equals 10 cm² we can measure even 10 times higher amount of the chemical in a given test. After that even measured results look like differently.

What does it mean for the user? It means that for finding of the effectiveness of the protective garment barrier there is need to take into account not only data concerning permeation but also the time of possible wearing of the garment, a permissible size of the garment which can be in contact with the chemical and, finally, toxicity of the chemical substance. After considering all this data it is possible to decide whether a particular garment provides enough protection to the user in a concrete situation.

Regarding the facts mentioned above it is necessary to point to the other very often introduced properties of the garment. In the same way very often user asks to weight, respectively the thickness of the material of the protective garment. These both facts, however, plays no essential role regarding the fact that in no way they influence its mechanical rigidity or chemical barrier. Larger areal dimension naturally affect its bigger weight. It is, however, a negative thing for user's comfort. A basic problematic approach determinate the quality of user's decision should be the fact, which materials have been used as proper protective barrier. This one determines the quality of any isolative garment. Butyl-rubber, thus isobutylene-isoprene rubber is a typical non-polar polymer which is typical by its elasticity. This one is caused due to no permissible bonds as we know them within rigid polymers.

Conclusion

It stands to reason that materials of such as characteristic mentioned above cannot be resistant against the whole spectrum of toxic compounds. In accordance to current knowledge it can be claimed that they provide an excellent protection against the affection of classic chemical warfare agents which has been considered as a significant security threats in the time of the cold war. Nowadays, threats have achieved another dimension at time, when the World makes an effort to fulfill declarations concerning the prohibitions of such a type of these weapons [5]. At the same time we have to speak about classic organic and inorganic toxic chemicals which were not been quasi mentioned and thus they were not been taken into account within testing of barrier materials' chemical resistance. Testing of the resistance just in the relationship to these compounds is a very important challenge for all authorities and institutions which in the long term deal with problems of the branch of individual and collection protection development.

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