

# Why to Study Chemical Resistance of Selected Ipe against Effects of Decontamination Mixtures?

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## Introduction

The Czech Armed Forces (CAF) Chemical Corps (CCs) units are mainly designated for fulfillment of tasks of chemical support and CBRN Defence in all types of military operations. The most complicated tasks of decontamination of units, formations and brigades which include personnel decontamination, casualty decontamination, decontamination of personnel weapons and Individual Protective Equipment (IPE) is performed by the CAF CCs units. Their operational deployment is supposed mainly in situations when the tasks of thorough decontamination are going to be fulfilled on decontamination sites deployed in a framework of decontamination areas. Fulfillment of a lot of regime measurements among them it is possible to submit a great number of security and protective measurements are assumed on decontamination sites. Among protective measurements belongs mainly provision of the quality of the CAF CCs specialists' body surface isolative protection. Isolative protective equipment introduced in the CAF CCs uses butyl rubber both-side coated on a polyamide carrier fabric as a basic constructive material. A basic question thus is: "Is butyl rubber suitable material for provision of specialists' isolative protection against the effects of decontamination mixtures?"

It is necessary to realize that device designated for body surface isolative protection comes into the touch with decontamination mixtures within fulfillment of different tasks thus within different activities. As basic ones can be considered these of them which cohere with fulfillment of professional tasks on the decontamination site. Tasks which directly cohere with personnel decontamination, casualty decontamination and decontamination of material and personnel weapons suppose long-term chemical resistance of isolative devices against the impact of often very aggressive decontamination mixtures. In this connection it is necessary to remind that in these cases can be dealt with a relatively long-term contact of a butyl rubber isolative protective folio with a liquid phase of chemicals created decontamination mixtures. A choice of decontamination mixture relates with decisions directed to this in order to decontaminated people, equipment, material and personnel weapons have fulfilled demands on reached values of residual contamination after performed decontamination. Accomplishment of these tasks can be accompanied even by multiple repetition of a decontamination process which the length of the contact of the isolative protective garments with toxic compounds can immoderately prolong. In these cases can very often play a role specialists' resolve to complete determinate tasks in demanded quality which can significantly limit their attention devoted just to quality of provided protection. In these cases takes up the necessity of acceptance of command and organizational measurements which, however, have to supported by proper knowledge of protective properties of particular protective garments [1]. As a basic value which describes isolative protective garments from this point of view is the value of breakthrough time (BTT). This value describes the length of a protective effect of a considered constructive material against the influence of toxic compounds, thus the time which flows from the first moment of toxic compound with test material till the time when its concentration reveals in its back side. The highness of this concentration

depends on an employed method of measurement whereas it has to response to the values determinate in ČSN EN 6529 [2,3].

Knowledge of particular value of BTT in combination with the knowledge of a decontamination mixtures composition not only of them which are introduced in the CAF but also in other armies of North-Atlantic Alliance is thus an essential information base for commanders' decisions concerning fulfillment of tasks by the CAF CCs specialists within fulfillment of tasks on decontamination places by which comes into a direct contact of the isolative protective garment with decontamination mixtures. Commanders have to take into account the overall time of decontamination mixtures preparation in isolative garments and time of decontamination performance. At the time of decontamination mixtures preparation even within fulfillment of decontamination tasks namely can come to sprinkle of liquid components during their mixing and coating on the surface of decontaminated materials, for example with the help of brushes, and thus for un-wanted contamination of the garment.

Another possible case when isolative protective garments can come into the direct contact with decontamination mixtures is their own decontamination after fulfillment of professional tasks. In such cases, however, it will be always selected forward only these decontamination mixtures whose effects on materials used for ensuring of isolative protection will be generally known. In current time in the area of the CAF hypochlorite detoxification mixtures is employed. This one has practically no negative effects on isolative protective materials. Its negative affection can reveal only in the case when it is used for decontamination of equipment and other vehicles, this in cases when it is enriched by the petroleum. This case, however, falls with the first category described above.

Both above mentioned cases of the contact of the isolative protective folio used to the construction of protective device for the CAF CCs are characterized by one of very important approach. The repeat ability to underlie of repetition decontamination is this approach. Isolative protective garments of body surface protection are not usually once-and-for-all garments. From this reason they should be constructed from such as materials whose their long-term and, furthermore, repeat employment connected with repeat decontamination ensures [4]. If we ignore the mechanical resistance which plays very crucial role so for absolutely principal the chemical resistance determinate in accordance

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to the norm of the ČSN EN 943-1 can be considered [5]. Big majority of introduced and used decontamination mixtures contain organic components which belong to chlorinated linear aliphatic hydrocarbons. As an example of such a decontamination mixture which contains 1,2-dichloroethane is detoxification mixture no 1. This non-polar hydrocarbon is characteristic by high ability to permeate through a butyl rubber polymeric mixture thus through materials from those the isolative protective devices within the ACR are constructed. Moreover, this chemical substance is very dangerous from the dermal toxicity point of view. These effects are study by Fiala [6]. All these approaches which have been mentioned above lead scientific workers to development of methods of testing and development of constructive materials used for construction of isolative protective garments designated for protection of the CAF CCs specialists' body surface protection [7,8].

This activity, however, has to go out from real knowledge of the influence of the Chemical Warfare Agents (CWA), Toxic Industrial Materials (TIM) and decontamination mixtures on particular barrier material. Pieces of knowledge which have been gained at the NBC Defence Institute of the University of Defence from the study of toxic compounds permeation through butyl rubber materials can be considered as a base of other experimental work [9]. These ones can be directed to some areas. Among these activities which are the most interested for the CAF CCs specialists belong to the area of development of method of testing of the quality of chemical resistance of materials used for the isolative protection, to the area of experimental works solving possible measurements for improvement of introduced isolative garments and, moreover, into the group of works dealing with possibilities of development and testing of non-aggressive decontamination mixtures. These challenges are obligations at the same time. These ones concern further development of the branch of individual and collective protection. About them is going to be dealt in other additional articles.

Problems which have to be solved in the area of development of devices designated for the CAF CCs specialists' protection is a big number. It is necessary to determine priorities and orders for their solution. At the same time it will be necessary to bind experimental works' results with the practice life of specialists from foreign missions. All these activities call for the need of conceptual approaches to problems of the individual and collective branch. The conception is possible to understand as a process of creation of financial assumptions for either modernization or purchase of such as isolative protection which fulfils the highest demands of ensuring of protection of specialists against what possible the most widest spectrum of introduced and perspective CWA and TIM.

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